February 26, 2011

Regulation Lax as Gas Wells' Tainted Water Hits Rivers

By IAN URBINA

The American landscape is dotted with hundreds of thousands of new wells and drilling rigs, as the country scrambles to tap into this century's gold rush — for natural gas.

The gas has always been there, of course, trapped deep underground in countless tiny bubbles, like frozen spills of seltzer water between thin layers of shale rock. But drilling companies have only in recent years developed techniques to unlock the enormous reserves, thought to be enough to supply the country with gas for heating buildings, generating electricity and powering vehicles for up to a hundred years.

So energy companies are clamoring to drill. And they are getting rare support from their usual sparring partners. Environmentalists say using natural gas will help slow climate change because it burns more cleanly than coal and oil. Lawmakers hail the gas as a source of jobs. They also see it as a way to wean the United States from its dependency on other countries for oil.

But the relatively new drilling method — known as high-volume horizontal hydraulic fracturing, or hydrofracking — carries significant environmental risks. It involves injecting huge amounts of water, mixed with sand and chemicals, at high pressures to break up rock formations and release the gas.

With hydrofracking, a well can produce over a million gallons of wastewater that is often laced with highly corrosive salts, carcinogens like benzene and radioactive elements like radium, all of which can occur naturally thousands of feet underground. Other carcinogenic materials can be added to the wastewater by the chemicals used in the hydrofracking itself.

While the existence of the toxic wastes has been reported, thousands of internal documents obtained by The New York Times from the Environmental Protection Agency, state regulators and drillers show that the dangers to the environment and health are greater than previously understood.

The documents reveal that the wastewater, which is sometimes hauled to sewage plants not designed to treat it and then discharged into rivers that supply drinking water,

contains radioactivity at levels higher than previously known, and far higher than the level that federal regulators say is safe for these treatment plants to handle.

Other documents and interviews show that many E.P.A. scientists are alarmed, warning that the drilling waste is a threat to drinking water in Pennsylvania. Their concern is based partly on a 2009 study, never made public, written by an E.P.A. consultant who concluded that some sewage treatment plants were incapable of removing certain drilling waste contaminants and were probably violating the law.

The Times also found never-reported studies by the E.P.A. and a confidential study by the drilling industry that all concluded that radioactivity in drilling waste cannot be fully diluted in rivers and other waterways.

But the E.P.A. has not intervened. In fact, federal and state regulators are allowing most sewage treatment plants that accept drilling waste not to test for radioactivity. And most drinking-water intake plants downstream from those sewage treatment plants in Pennsylvania, with the blessing of regulators, have not tested for radioactivity since before 2006, even though the drilling boom began in 2008.

In other words, there is no way of guaranteeing that the drinking water taken in by all these plants is safe.

That has experts worried.

"We're burning the furniture to heat the house," said John H. Quigley, who left last month as secretary of Pennsylvania's Department of Conservation and Natural Resources. "In shifting away from coal and toward natural gas, we're trying for cleaner air, but we're producing massive amounts of toxic wastewater with salts and naturally occurring radioactive materials, and it's not clear we have a plan for properly handling this waste."

The risks are particularly severe in Pennsylvania, which has seen a sharp increase in drilling, with roughly 71,000 active gas wells, up from about 36,000 in 2000. The level of radioactivity in the wastewater has sometimes been hundreds or even thousands of times the maximum allowed by the federal standard for drinking water. While people clearly do not drink drilling wastewater, the reason to use the drinking-water standard for comparison is that there is no comprehensive federal standard for what constitutes safe levels of radioactivity in drilling wastewater.

Drillers trucked at least half of this waste to public sewage treatment plants in Pennsylvania in 2008 and 2009, according to state officials. Some of it has been sent to other states, including New York and West Virginia.

Yet sewage treatment plant operators say they are far less capable of removing radioactive contaminants than most other toxic substances. Indeed, most of these facilities cannot remove enough of the radioactive material to meet federal drinking-water standards before discharging the wastewater into rivers, sometimes just miles upstream from drinking-water intake plants.

In Pennsylvania, these treatment plants discharged waste into some of the state's major river basins. Greater amounts of the wastewater went to the Monongahela River, which provides drinking water to more than 800,000 people in the western part of the state, including Pittsburgh, and to the Susquehanna River, which feeds into Chesapeake Bay and provides drinking water to more than six million people, including some in Harrisburg and Baltimore.

Lower amounts have been discharged into the Delaware River, which provides drinking water for more than 15 million people in Philadelphia and eastern Pennsylvania.

In New York, the wastewater was sent to at least one plant that discharges into Southern Cayuga Lake, near Ithaca, and another that discharges into Owasco Outlet, near Auburn. In West Virginia, a plant in Wheeling discharged gas-drilling wastewater into the Ohio River.

"Hydrofracking impacts associated with health problems as well as widespread air and water contamination have been reported in at least a dozen states," said Walter Hang, president of Toxics Targeting, a business in Ithaca, N.Y., that compiles data on gas drilling.

Problems in Other Regions

While Pennsylvania is an extreme case, the risks posed by hydrofracking extend across the country.

There were more than 493,000 active natural-gas wells in the United States in 2009, almost double the number in 1990. Around 90 percent have used hydrofracking to get more gas flowing, according to the drilling industry.

Gas has seeped into underground drinking-water supplies in at least five states, including Colorado, Ohio, Pennsylvania, Texas and West Virginia, and residents blamed natural-gas drilling.

Air pollution caused by natural-gas drilling is a growing threat, too. Wyoming, for example, failed in 2009 to meet federal standards for air quality for the first time in its history partly because of the fumes containing benzene and toluene from roughly 27,000 wells, the vast majority drilled in the past five years.

In a sparsely populated Sublette County in Wyoming, which has some of the highest concentrations of wells, vapors reacting to sunlight have contributed to levels of ozone higher than those recorded in Houston and Los Angeles.

Industry officials say any dangerous waste from the wells is handled in compliance with state and federal laws, adding that drilling companies are recycling more wastewater now. They also say that hydrofracking is well regulated by the states and that it has been used safely for decades.

But hydrofracking technology has become more powerful and more widely used in recent years, producing far more wastewater. Some of the problems with this drilling, including its environmental impact and the challenge of disposing of waste, have been documented by ProPublica, The Associated Press and other news organizations, especially out West.

And recent incidents underscore the dangers. In late 2008, drilling and coal-mine waste released during a drought so overwhelmed the Monongahela that local officials advised people in the Pittsburgh area to drink bottled water. E.P.A. officials described the incident in an internal memorandum as "one of the largest failures in U.S. history to supply clean drinking water to the public."

In Texas, which now has about 93,000 natural-gas wells, up from around 58,000 a dozen years ago, a hospital system in six counties with some of the heaviest drilling said in 2010 that it found a 25 percent asthma rate for young children, more than three times the state rate of about 7 percent.

"It's ruining us," said Kelly Gant, whose 14-year-old daughter and 11-year-old son have experienced severe asthma attacks, dizzy spells and headaches since a compressor station and a gas well were set up about two years ago near her house in Bartonville, Tex. The industry and state regulators have said it is not clear what role the gas industry has played in causing such problems, since the area has had high air pollution for a while.

"I'm not an activist, an alarmist, a Democrat, environmentalist or anything like that," Ms. Gant said. "I'm just a person who isn't able to manage the health of my family because of all this drilling."

And yet, for all its problems, natural gas offers some clear environmental advantages over coal, which is used more than any other fuel to generate electricity in the United States. Coal-fired power plants without updated equipment to capture pollutants are a major source of radioactive pollution. Coal mines annually produce millions of tons of toxic waste.

But the hazards associated with natural-gas production and drilling are far less understood than those associated with other fossil fuels, and the regulations have not kept pace with the natural-gas industry's expansion.

Pennsylvania, Ground Zero

Pennsylvania, which sits atop an enormous reserve called the Marcellus Shale, has been called the Saudi Arabia of natural gas.

This rock formation, roughly the size of Greece, lies more than a mile beneath the Appalachian landscape, from Virginia to the southern half of New York. It is believed to hold enough gas to supply the country's energy needs for heat and electricity, at current consumption rates, for more than 15 years.

Drilling companies were issued roughly 3,300 Marcellus gas-well permits in Pennsylvania last year, up from just 117 in 2007.

This has brought thousands of jobs, five-figure windfalls for residents who lease their land to the drillers and revenue for a state that has struggled with budget deficits. It has also transformed the landscape of southwestern Pennsylvania and brought heavy burdens.

Drilling derricks tower over barns, lining rural roads like feed silos. Drilling sites bustle around the clock with workers, some in yellow hazardous material suits, and 18-wheelers haul equipment, water and waste along back roads.

The rigs announce their presence with the occasional boom and quiver of underground explosions. Smelling like raw sewage mixed with gasoline, drilling-waste pits, some as large as a football field, sit close to homes.

Anywhere from 10 percent to 40 percent of the water sent down the well during hydrofracking returns to the surface, carrying drilling chemicals, very high levels of salts and, at times, naturally occurring radioactive material.

While most states require drillers to dispose of this water in underground storage wells below impermeable rock layers, Pennsylvania has few such wells. It is the only state that has allowed drillers to discharge much of their waste through sewage treatment plants into rivers.

Regulators have theorized that passing drilling waste through the plants is safe because most toxic material will settle during the treatment process into a sludge that can be trucked to a landfill, and whatever toxic material remains in the wastewater will be diluted when mixed into rivers. But some plants were taking such large amounts of waste

with high salt levels in 2008 that downstream utilities started complaining that the river water was eating away at their machines.

Regulators and drilling companies have said that these cases, and others, were isolated.

"The wastewater treatment plants are effective at what they're designed to do — remove material from wastewater," said Jamie Legenos, a spokeswoman for the Pennsylvania Department of Environmental Protection, adding that the radioactive material and the salts were being properly handled.

Overwhelmed, Underprepared

For proof that radioactive elements in drilling waste are not a concern, industry spokesmen and regulators often point to the results of wastewater tests from a 2009 draft report conducted by New York State and a 1995 report by Pennsylvania that found that radioactivity in drilling waste was not a threat. These two reports were based on samples from roughly 13 gas wells in New York and 29 in Pennsylvania.

But a review by The Times of more than 30,000 pages of federal, state and company records relating to more than 200 gas wells in Pennsylvania, 40 in West Virginia and 20 public and private wastewater treatment plants offers a fuller picture of the wastewater such wells produce and the threat it poses.

Most of the information was drawn from drilling reports from the last three years, obtained by visiting regional offices throughout Pennsylvania, and from documents or databases provided by state and federal regulators in response to records requests.

Among The Times's findings:

¶More than 1.3 billion gallons of wastewater was produced by Pennsylvania wells over the past three years, far more than has been previously disclosed. Most of this water — enough to cover Manhattan in three inches — was sent to treatment plants not equipped to remove many of the toxic materials in drilling waste.

¶At least 12 sewage treatment plants in three states accepted gas industry wastewater and discharged waste that was only partly treated into rivers, lakes and streams.

¶Of more than 179 wells producing wastewater with high levels of radiation, at least 116 reported levels of radium or other radioactive materials 100 times as high as the levels set by federal drinking-water standards. At least 15 wells produced wastewater carrying more than 1,000 times the amount of radioactive elements considered acceptable.

Results came from field surveys conducted by state and federal regulators, year-end reports filed by drilling companies and state-ordered tests of some public treatment

plants. Most of the tests measured drilling wastewater for radium or for "gross alpha" radiation, which typically comes from radium, uranium and other elements.

Industry officials say they are not concerned.

"These low levels of radioactivity pose no threat to the public or worker safety and are more a public perception issue than a real health threat," said James E. Grey, chief operating officer of Triana Energy.

In interviews, industry trade groups like the Marcellus Shale Coalition and Energy in Depth, as well as representatives from energy companies like Shell and Chesapeake Energy, said they were producing far less wastewater because they were recycling much of it rather than disposing of it after each job.

But even with recycling, the amount of wastewater produced in Pennsylvania is expected to increase because, according to industry projections, more than 50,000 new wells are likely to be drilled over the next two decades.

The radioactivity in the wastewater is not necessarily dangerous to people who are near it. It can be blocked by thin barriers, including skin, so exposure is generally harmless.

Rather, E.P.A. and industry researchers say, the bigger danger of radioactive wastewater is its potential to contaminate drinking water or enter the food chain through fish or farming. Once radium enters a person's body, by eating, drinking or breathing, it can cause cancer and other health problems, many federal studies show.

Little Testing for Radioactivity

Under federal law, testing for radioactivity in drinking water is required only at drinking-water plants. But federal and state regulators have given nearly all drinking-water intake facilities in Pennsylvania permission to test only once every six or nine years.

The Times reviewed data from more than 65 intake plants downstream from some of the busiest drilling regions in the state. Not one has tested for radioactivity since 2008, and most have not tested since at least 2005, before most of the drilling waste was being produced.

And in 2009 and 2010, public sewage treatment plants directly upstream from some of these drinking-water intake facilities accepted wastewater that contained radioactivity levels as high as 2,122 times the drinking-water standard. But most sewage plants are not required to monitor for radioactive elements in the water they discharge. So there is virtually no data on such contaminants as water leaves these plants. Regulators and gas producers have repeatedly said that the waste is not a threat because it is so diluted in

rivers or by treatment plants. But industry and federal research cast doubt on those statements.

A confidential industry study from 1990, conducted for the American Petroleum Institute, concluded that "using conservative assumptions," radium in drilling wastewater dumped off the Louisiana coast posed "potentially significant risks" of cancer for people who eat fish from those waters regularly.

The industry study focused on drilling industry wastewater being dumped into the Gulf of Mexico, where it would be far more diluted than in rivers. It also used estimates of radium levels far below those found in Pennsylvania's drilling waste, according to the study's lead author, Anne F. Meinhold, an environmental risk expert now at NASA.

Other federal, state and academic studies have also found dilution problems with radioactive drilling waste.

In December 2009, these very risks led E.P.A. scientists to advise in a letter to New York that sewage treatment plants not accept drilling waste with radium levels 12 or more times as high as the drinking-water standard. The Times found wastewater containing radium levels that were hundreds of times this standard. The scientists also said that the plants should never discharge radioactive contaminants at levels higher than the drinking -water standard.

In 2009, E.P.A. scientists studied the matter and also determined that certain Pennsylvania rivers were ineffective at sufficiently diluting the radium-laced drilling wastewater being discharged into them.

Asked about the studies, Pennsylvania regulators said they were not aware of them.

"Concerned? I'm always concerned," said Dave Allard, director of the Bureau of Radiation Protection. But he added that the threat of this waste is reduced because "the dilutions are so huge going through those treatment plants."

Three months after The Times began asking questions about radioactive and other toxic material being discharged into specific rivers, state regulators placed monitors for radioactivity near where drilling waste is discharged. Data will not be available until next month, state officials said.

But the monitor in the Monongahela is placed upstream from the two public sewage treatment plants that the state says are still discharging large amounts of drilling waste into the river, leaving the discharges from these plants unchecked and Pittsburgh exposed.

Plant Operators in the Dark

In interviews, five treatment plant operators said they did not believe that the drilling wastewater posed risks to the public. Several also said they were not sure of the waste's contents because the limited information drillers provide usually goes to state officials.

"We count on state regulators to make sure that that's properly done," said Paul McCurdy, environmental specialist at Ridgway Borough's public sewage treatment plant, in Elk County, Pa., in the northwest part of the state.

Mr. McCurdy, whose plant discharges into the Clarion River, which flows into the Ohio and Mississippi Rivers, said his plant was taking about 20,000 gallons of drilling waste per day.

Like most of the sewage treatment plant operators interviewed, Mr. McCurdy said his plant was not equipped to remove radioactive material and was not required to test for it.

Documents filed by drillers with the state, though, show that in 2009 his facility was sent water from wells whose wastewater was laced with radium at 275 times the drinking-water standard and with other types of radiation at more than 780 times the standard.

Part of the problem is that industry has outpaced regulators. "We simply can't keep up," said one inspector with the Pennsylvania Department of Environmental Protection who was not authorized to speak to reporters. "There's just too much of the waste."

"If we're too hard on them," the inspector added, "the companies might just stop reporting their mistakes."

Recently, Pennsylvania has tried to increase its oversight, doubling the number of regulators, improving well-design requirements and sharply decreasing how much drilling waste many treatment plants can accept or release. The state is considering whether to require treatment plants to begin monitoring for radioactivity in wastewater.

Even so, as of last November, 31 inspectors were keeping tabs on more than 125,000 oil and gas wells. The new regulations also allowed at least 18 plants to continue accepting the higher amounts set by their original permits.

Furthermore, environmental researchers from the University of Pittsburgh tested wastewater late last year that had been discharged by two treatment plants. They say these tests will show, when the results are publicly released in March, that salt levels were far above the legal limit.

Lax Oversight

Drilling contamination is entering the environment in Pennsylvania through spills, too. In the past three years, at least 16 wells whose records showed high levels of radioactivity

in their wastewater also reported spills, leaks or failures of pits where hydrofracking fluid or waste is stored, according to state records.

Gas producers are generally left to police themselves when it comes to spills. In Pennsylvania, regulators do not perform unannounced inspections to check for signs of spills. Gas producers report their own spills, write their own spill response plans and lead their own cleanup efforts.

A review of response plans for drilling projects at four Pennsylvania sites where there have been accidents in the past year found that these state-approved plans often appear to be in violation of the law.

At one well site where several spills occurred within a week, including one that flowed into a creek, the well's operator filed a revised spill plan saying there was little chance that waste would ever enter a waterway.

"There are business pressures" on companies to "cut corners," John Hanger, who stepped down as secretary of the Pennsylvania Department of Environmental Protection in January, has said. "It's cheaper to dump wastewater than to treat it."

Records back up that assertion.

From October 2008 through October 2010, regulators were more than twice as likely to issue a written warning than to levy a fine for environmental and safety violations, according to state data. During this period, 15 companies were fined for drilling-related violations in 2008 and 2009, and the companies paid an average of about $44,000 each year, according to state data.

This average was less than half of what some of the companies earned in profits in a day and a tiny fraction of the more than $2 million that some of them paid annually to haul and treat the waste.

And prospects for drillers in Pennsylvania are looking brighter.

In December, the Republican governor-elect, Tom Corbett, who during his campaign took more gas industry contributions than all his competitors combined, said he would reopen state land to new drilling, reversing a decision made by his predecessor, Edward G. Rendell. The change clears the way for as many as 10,000 wells on public land, up from about 25 active wells today.

In arguing against a proposed gas-extraction tax on the industry, Mr. Corbett said regulation of the industry had been too aggressive.

"I will direct the Department of Environmental Protection to serve as a partner with Pennsylvania businesses, communities and local governments," Mr. Corbett says on his Web site. "It should return to its core mission protecting the environment based on sound science."

The Sydney Morning Herald

Environment

Birds, trees - and drillers: Miners shatter the 'tree change' tranquility

Kate Dennehy
October 10, 2010

A waterhole contaminated with heavy oil slick - allegedly from coal seam gas exploration on the Western Downs between Tara and Chinchilla. Photo: Supplied

Michael Bretherick and his family moved to Tara, about 400 kilometres west of Brisbane,four years ago for a tree change.

He said the mining company, BG Group – owners of QGC – moved into the area about 18 months ago and has been drilling night and day for coal-seam gas.

Coal-seam gas extraction requires the removal of large volumes of water from coal seams to release trapped gases.

Contaminated waste (driller's mud) allegedly from coal seam gas exploration on the Western Downs between Tara and Chinchilla. Photo: Supplied

He cited a litany of grievances against the company, including allegations of constant noise, adverse health impacts for humans and farm stock, potential damage and contamination of aquifers, polluted dams, and contaminated water in tanks.

“Our dreams have been turned into nightmares. I’m 64 and I came here to retire but because of the mining we want to leave but there’s no way anyone would want to buy here so we can’t sell,’’ he said.

Mr Bretherick said his youngest children, aged 7 and 9, had rashes and nosebleeds after playing near a dam. ‘‘A calf fell into the dam and only lived a couple of minutes; its skin peeled off,’’ he said.

Once the mining started, neighbour was pitted against neighbour, marriages have split, businesses have closed and many locals are

suffering health problems including depression, he said.

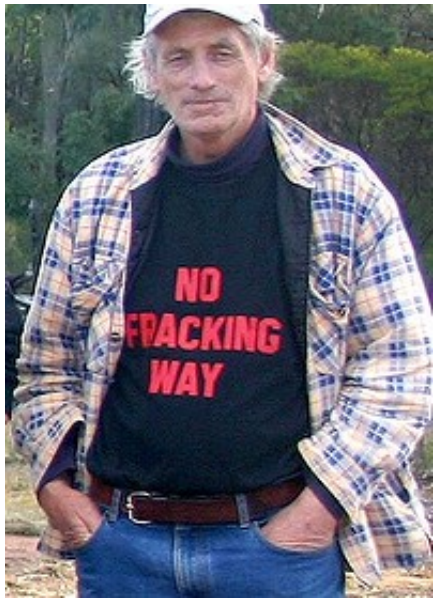
Mr Bretherick helped set up the website Tarablockies.com and runs the Western Downs Alliance set up to fight the miners.

“They want to put gas wells 750metres apart, including compressors, through properties and we just won’t have it. We’ll either lock them in or we’ll lock them out,” he said.

Environmentalist Dayne Pratzky of Chinchilla said small groups around the country were joining forces to fight large-scale mining. He said 22 groups from Queensland, NSW and Victoria comprising thousands of members would have much more ‘‘clout’’ than isolated protesters.

‘‘The government has allowed the mining companies to have free rein for whatever they wanted to do because of the royalties they receive but this new group will be a force to be reckoned with,’’ he said.

The government insists it is striking the right balance between environmental sustainability and economic growth and is monitoring the mining.



Western Downs Alliance Action Group co-founder Michael Bretherick. Photo: Supplied

A QGC spokesman said the company operated within an extensive code of conduct and regulations set by the state government.

He said QGC took precautions to minimise noise and to ensure water supplies were not impacted.

Also in Environment:

Heavy snow hits Europe

Snow and freezing temperatures severely disrupted airports in Germany and Britain and caused chaos and deaths on roads across Europe on Tuesday.

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RECEIVED
11 APR 2011
DERM
GAS & PETROLEUM

8 April 2011

Dear Ahmad

Amendment application for PEN100020207

I refer to QGC's amendment application for environmental authority PEN100020207, submitted to the Department of Environment and Resource Management (DERM) on 30 June 2010.

The following environmental authority amendments were sought in that application to service the existing domestic supply operations of QGC:

- Incorporation of Petroleum Lease areas to support applications made for PLA 212 (1st July, 2004), and PLA 263 (22nd February 2008) into the active tenements licensed under the administrative scope of PEN 100020207;
- Incorporation of one (1) new field Compression Station within PL229,
- Construction of a 92ML/d Water Treatment Facility (WTP) with environmental licence to operate and produce up to 52ML/d of treated water under existing domestic gas supply operations.

The operation of the proposed WTP requires:

a) an additional Level 1 Environmentally Relevant Activity ERA 64 – Water Treatment;

b) an additional Level 1 Environmentally Relevant Activity ERA 8D (ii) – Chemical Storage;

c) an additional Level 1 Environmentally Relevant Activity ERA 14 (i) – Electricity Generation;

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- Incorporation of an authority for short-term discharge and ongoing provision for emergency discharge of up to 40ML/d of treated CSG water into Wieambilla Creek. In a subsequent reply to the DERM information request in September 2010, QGC reduced the short-term discharge to a maximum volume of 12ML/d and removed the request for an emergency discharge.

- Construction of new raw water and brine evaporation ponds required for the operation of the WTP. The detailed design of which are to be lodged for DERM approval, in accordance with existing EA conditions relating to pond construction and management.

DERM and QGC have engaged in an extensive negotiation process over the last 9 months with QGC committing to and undertaking additional work with regard to collection of additional information on ambient water quality which has enabled the determination of a local water quality guideline for Wieambilla Creek. QGC has also responded to numerous additional information requests. In conclusion of the fulfilment of information requested by DERM, please find attached;

- Appendix 1: *RPS report (March 2011) Water Quality Summary for Wieambilla Creek,*
- Appendix 2: *QGC memorandum (01/04/11) Wieambilla Creek Water Quality Assessment,* and
- Appendix 3: *Summary Statistic data for individual sampling points in the Wieambilla Creek catchment.*

QGC has reviewed the most recent version of DERM's amended environmental authority for PEN100020207 (version 9) received by Fiona Marks, Water Environment Manager, on 29 March 2011.

Whilst DERM has proposed, and it has been previously discussed in negotiations between DERM and QGC that "model conditions" would be considered for this environmental authority amendment application, there are in fact no agreed "model conditions" at this time and there is an industry-government process under way to reach agreement. That process is separate from our specific EA and EA amendment applications. QGC believes it is inappropriate to apply the draft "model conditions" to this environmental authority, considering they are still under negotiation DERM and the industry, represented by APPEA.

QGC has therefore reviewed its position regarding DERM's proposed revision of all conditions of the environmental authority in response to our amendment application for specific works."

The process in the EP Act requires DERM to establish grounds for the proposed changes and follow the required procedure in the EP Act which includes justification that the amendments are necessary or desirable as a result of QGC's amendment application. QGC believes that it is not necessary or desirable to change all of the conditions on PEN100020207 and QGC will not consent or request the change and application of the entire current draft model conditions to PEN100020207.

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As has been explained previously, QGC will be following the grant of the amendment of PEN100020207 with the immediate submission of a QCLNG amendment application for the Central Development Area. The intention is that the project EA (current PEN100020207) will reduce in size and scope significantly. QGC are already in negotiation with DERM for other QCLNG environmental authority applications which overlap the area covered by this project EA.

QGC has provided additional conditions in Appendix 4: *QGC PEN100020207 amendment conditions* that we propose are inserted into the existing PEN 100020207 for grant of this amendment application. We look forward to discussing this further with you to reach a mutually acceptable solution. QGC would appreciate a decision on this matter as soon as possible. Our understanding is that the attachments to this letter form the last outstanding information required by DERM to issue final draft conditions prior to a decision. Access to a discharge point for the WTP is schedule critical for the project and is required no later than 6th May 2011. If you have any questions, please contact Fiona Marks on 3201 7956.

Yours sincerely

Tracey Winters
General Manager Environment
tracey.winters@bg-group.com

Date: 5 February 2010

To: Laurie Arthur
Commissioner
National Water Commission

CC: David Crombie, National Farmers Federation
Ian Burnett, AgForce
Geoff Penton, QMDB
Dougal Gordon, ALFA
Roderick Gilmour, QGABAC
Ray Brown, Mayor, Western Downs Regional Council

Ground water concerns from Coal Seam Gas Extraction

Paper written by Anne Bridle 5/2/2010

Background

My family and I, operate Talbingo Pastoral Company encompassing 11,740 hectares of mixed farming country south of Dalby and 28,340 hectares of beef backgrounding country at Dirranbandi in Queensland. Talbingo, Dalby is situated on the headwaters of the Moonie River, yet less than 500 metres away from these headwaters, a Coal Seam Gas (CSG) producer holds coal seam gas water in a pond.

We operate a 1,250 head beef cattle feedlot and are licensed to expand to 5,000 head in capacity. The water for our feedlot is provided by bore for which we have an entitlement from the Kumbarilla Bed aquifer under the Water Act 2000. Cattle drinking water in the paddock is provided by 4bores (stock and domestic) and a number of overland flow dams. Over the last 10 years a number of our dams have gone dry due to dry weather. During this time we have, like others in the district, relied heavily on our bores to water stock.

Over the last 15 years, we have spread our climate and production risk across properties at Dalby and Dirranbandi with the later totally reliant on water from Gubbermunda aquifer in the Great Artesian Basin to water an extensive cattle herd. We have fully embraced and completed the GABSCI cap and pipe scheme on the Dirranbandi properties. Our feedlot built in 2006 provides a

contingency plan for drier times and a vertically integrated adjunct to our existing grain and beef production business. In 2008, Talbingo Feedlot was a finalist in the ALFA Feedlot of the Year Competition (<3,000 head capacity). We are licensed to expand our feedlot to 5,000 head capacity which would enable us to turn-off up to 15,000 head of cattle per year. Currently we employ 8 people full time at Talbingo and 2 people full time at Dirranbandi as well as casual contract staff in busy times. We purchase goods and services from local businesses in Dalby, Tara, St George and Bollon and hold major key accounts with business houses in Dalby, St George and Meandarra.

Escalating coal seam gas exploration and more recently production on neighbouring properties and across the Surat Basin is of concern to our business and long term viability due to the possibility of our bore water being unduly affected. We are afraid that coal seam gas extraction will eventually remove water that we are entitled to, taking away our livelihood. Whilst we understand the P&G Act has a make good clause for ground water damage, we are concerned that:

1) *baseline assessments for proving damage have not yet been done;*
2) *groundwater uncertainty as the coal seam gas industry rapidly grows, will stifle our opportunity to expand our feedlot;*
3) *without water supply our infrastructure could be stranded; and ultimately*
4) *CSG Companies, and collectively the CSG industry may not have the economic capacity to make good for other industries such as agriculture if groundwater resources are permanently damaged over time.*

I am aware that other rural businesses both larger and smaller than ours share my concern. I therefore make submission to you as a Commissioner with the National Water Commission to look into the issue of ground water impact from Coal Seam Gas Extraction and its long-term sustainability under current state government policy regimes. In doing so I ask that you consider the P&G Act 2004 and Water Act with respect to the National Water Commission Groundwater position statement. I also ask that in light of the issues raised you provide direction to me and others about how we can protect our long-term viability.

Ground water is the lifeblood of rural businesses and towns in rural and regional communities in Queensland. Climate change towards lower rainfall and higher temperatures will only serve to exacerbate this reliance. Surface and ground water are interlinked and coal seams from which gas is extracted are part of the Great Artesian Basin. Escalation of coal seam gas extraction in Queensland's Surat Basin by its very nature of unregulated and unlimited dewatering, threatens the sustainability of this groundwater system over time.

The highly sought after coal seam methane is held on cleats in the underground coal. The coal seams are not a discreet closed system separate from aquifers above or below them. [Refer: Great Artesian Basin Resource Plan that calls up the Walloon Coal Measures as a distinct management unit within the Great Artesian Basin]. This fact has been missed by many of the CSG companies in their Environmental Impact Studies. CSG companies dewater a coal seam to allow the gas to release from the cleats in the coal. Whilst there are confining layers between the different stratigraphic layers, these confining layers are not watertight and water can migrate between the layers. If dewatering of a system changes the level of the heads significantly, water will migrate laterally and from aquifers above and below. [Refer diagrams Mal Hellmuth's DEEDI Powerpoint presentation, CSG Conference Nov 2009]

Current state government policy dictates CSG companies can withdraw whatever water they need to take, in order to get the gas out. They can use that water for a number of uses within their tenure (determined by definition of "associated activity"). More recently CSG companies are treating the water through reverse osmosis and using it for tree plantations as carbon offsets. Treated water has also been used for cropping irrigation on CSG company owned land. With over 40,000 CSG wells planned to be drilled in the next 3-10 years across the Surat Basin, there are serious concerns for ground water impact.

Ground water concerns from coal seam gas extraction include:

- Contamination from associated water stored at the surface to land and water resources. The sheer volume of 196 Gigalitres of water per year has implications for damage if there is mishap/leakage. Water must be held at some point before use or treatment. As water held in holding ponds naturally evaporates, chemicals, salt and contaminants cumulatively build up. Additionally it has been estimated that up to 10% of associated water cannot be recovered through a reverse osmosis process leaving a huge annual concentrated brine waste to deal with.

- draining contaminated water from coal seams into deeper clean aquifers within the Great Artesian Basin

- the **time lag** between cause (drilling) and effect (draining/contaminants/intermingling of aquifers) The effect could be 10-15 years or longer away

- Contamination of relatively clean ground water could also occur from chemicals used in the fracturing or even drilling process;

- A reduction of recharge retention in areas of gas extraction. Ground water recharge is a natural yet unpredictable event where the seam meets the surface on the inner ranges. Recharge will still occur regardless of the CSG extraction footprint yet how much of that recharged water would make it into the GAB management unit where gas extraction is taking place? Where recharged water migrates to the site of CSG extraction it will most possibly be dewatered. There will also be recharge water from the shallower aquifers which will migrate to the CSG extraction sites and gets dewatered.

- "Time pressure: The "use it or loose it" approach applied to Authority to Prospect licensing exerts a time pressure which is inconsistent with support for long term viability and sustainability to existing industries. Physically transitioning wells from exploration to production can now be done in a matter of days (4) provided a PLA is in place.

Additional factors which may affect impact:

- Grid pattern.
- Fracturing. [Refer Scientific American Article]
- Cumulative affect – CSG & other mining activity
- Uptake of new technologies

Grid pattern Depending on the geology of the ground, wells are spaced on a grid pattern. Typically this has been anywhere from a 500m grid up to a 1200m grid pattern. Whilst the

well grid facilitates a wider dewatering of the coal seam it also resembles over allocation and goes against the very system in place to manage, preserve and harness groundwater.

Fracturing In coal seam gas extraction, where gas is slow to release from the cleats in the coal as the water is removed; hydraulic fracturing may be used to improve gas recovery. Hydraulic fracturing (or "fracking") involves pumping a chemical mixture under high pressure (+3000psi) to blast (fracture) open the coal seam and keep the fracture open. From what I understand the mixture typically comprises water, a "carrying solution" and silica or fine sand. The length, angle and direction of the fracture cannot be fully controlled. The blast at the fracture site in the bore well radiates 360 degrees. [Refer Scientific American Article] As a current example, a CSG well south of Dalby was drilled to a depth of just over 850 metres. This well was recently "fracted" at 9 different depths between 400m and 850m.

Cumulative affect – CSG/other mining/ other activities. The cumulative affect of coal seam gas extraction and wells in the Surat Basin will exacerbate changes in head levels and water quality previously only considered on a local or adjacent bore water user basis. The wide scale dewatering of the Walloon Coal Seam across the Surat Basin will cause water drawdown, quality changes in water and water migration. What will this mean for Great Artesian Basin Water Act bores in other areas of Queensland? How extensive will the area be that is affected by the wide-scale dewatering of the Walloons? Given the energy boom in the Surat Basin, are appropriate separation distances observed between coals seam gas and other forms of mining?

New technologies uptake New technologies are being developed to aid in minimizing associated water being produced with CSG extraction. Whilst I am uncertain of the uptake of these technologies in the Surat Basin I feel strongly that where these technologies reduce and minimise impact they should be encouraged or further, made a condition of the licensing approvals process.

Who ultimately owns the water?

- S19 Water Act 2000 – all rights to the use, flow and control of all water in Qld are vested in the State.

- **Right to ground water take under Water Act** - Entitlement to water under the Water Act 2000 is only possible if water is available in the specified aquifer. In Queensland there are 2,700 artesian and 15,000 sub-artesian bores within the Great Artesian Basin.

- Under the Water Act, there is provision for an un-interrupted water entitlement for stock and domestic use – yet there seems to be no protection for this provision within the P&G Act until the water runs out – if other users have to prove that damage has been done to the water supply, does this mean that every town or property bore has to be assessed at the time of commencement of CSG operations to enable proof that the extraction has damaged the aquifer to the detriment to other water users?

- **Right to water under P&G Act** - P&G Act 2004 - S185 (1), (2) Right to take/ ***unlimited volume*** S185 (3)c.DEEDI modelling (Nov 2009) estimates a mid-range of 196 GL of associated water per year (that is between 120-350 GL per annum of water removed from the ground over the next 20-40 years).

- I have been led to believe that it is unlikely that the Govt would ever impose a limit on water taken in the CSG extraction process as the companies need to dewater/de-pressure the coal seam to get the gas out. A limit would restrict their ability to control (reduce) pressures on the gas. Water within a coal seam needs to be constantly removed to maintain or reduce pressure. A limit would restrict CSG production and add years in time for that gas to be removed. Additionally it would follow that an equivalent amount of extra water will be lost from recharge as it occurs. Had CSG Companies ever applied for a Water Act licence to take water in the estimated quantities and densities planned for the next 5-20 years they would ***NEVER*** have got entitlement. Such take could not be sustained.

- **Monitoring and recording – P&G Act.** Current legislation prescribing monitoring and reporting of underground water impact by CSG companies was not met by any CSG company up until July 2009. Many CSG companies are yet to lodge these reports despite producing CSG for almost 10 years. The Queensland Government had not been enforcing compliance with the P&G Act. I am led to believe that some CSG companies establishing water head levels now are doing so at today's level not the original level off their drill log when they commenced production. What damage/draw down has already been done?

- **"Make Good" provision.** The P& G Act 2004 contains a "make good provision" which is intended to balance the right of the petroleum tenure holder to take underground water as part of its authorised activities against any adverse impacts upon existing Water Act bores by the taking of the water. The "make good" clause allows for either financial compensation for loss of water, water supply from an alternative source or deepening of existing water bores to access deeper water. However, to utilise the make good provision for such damage, damage must be proven and requires, baseline assessment prior to CSG activity commencing as well as proper and regular monitoring ,must have been done. I have been led to believe that baseline reporting has not been done.

- The Act was written at a time when CSG industry was in its infancy and there was not a significant concentration of petroleum gas extraction activity. Water from the Great Artesian Basin system is a finite resource fully allocated within guidelines for its sustainability. CSG producers do not have spare titles to Great Artesian Basin water to pass onto affected stakeholders in the event of significant damage. Transfer of title is possible under the Great Artesian Basin Relocation Scheme but this requires a willing buyer and a willing seller.

- In the event that cumulative CSG activity significantly damages underground water aquifers, from where will the alternative water come? How will CSG producers be able to compensate affected stakeholders for loss of their business as a result to damage to Water Act bores? It has been suggested that CSG producers could provide treated CSG water to affected Water Act bore users. However, how long will the treated CSG water last? 10 – 20 years? Again, in the event of adverse impact, from where, will the water come long after CSG producers have left and treated CSG water is no longer available? For how long does the obligation on petroleum tenure holders "to make good" last?

- **Associated water & associated activity.** The water taken by the tenure holder is known as associated water (which is a regulated /hazardous waste) and it can only be used by the tenure holder for another authorised activity for the tenure. To use associated water for another purpose the tenure holder must obtain a water licence and obtain approval from the EPA in most cases to beneficially use that water. Certain other approvals may also need to be obtained such a development approval. P&G Act S188 &

189; Water Act S19. Obtain water licence Ch2 Part 6. Section 66F Environmental Protection (Waste Management) Regulation 2000 – beneficial use.

- A CSG company that dewaters a coal seam and treats the water through a RO plant can apply to obtain a water licence for the beneficial use of that water. There have been suggestions that CSG companies are looking to sell treated water for $5000-$7,000/ML. Hypothetically, assume no damage has been done as yet to existing water entitlements and the CSG company on-sells that water for beneficial use. Assume also that over time damage does occur, draw down is affected and water entitlements are taken out through unavailable water. Theoretically the CSG has sold a water entitlement it never "owned" to the highest bidder. The system is again over allocating a finite resource. Time lag between cause and effect removes priority group consideration for water if damage is eventually done yet the associated water has already been treated and sold off. Additionally, I understand water for "beneficial use" requires **no** compliance for sodicity (sodium absorption ratio) – this has implications for soil structure over time.

- The placement of pipelines to transport treated CSG water under the P&G Act rather than the Water Act, means CSG companies can just put treated water pipelines through any landowners property in the future. Under the Water Act they would have had to have landholder permission in the form of an easement or a lease. Also under the Water Act they would have to get Water Licences hence making them have to contact priority groups and all other relevant regulations for water as per the Water Act 2000. [Refer O'Connor & O'Connor Vs Arrow (2009) Supreme Court of Queensland – Orders and Judgement]

- Who monitors the dams built on CSG owned land (seepage) and who regulates the associated water that finds it way to this land? Are there any regulations or is this matter self-regulated? CSG companies are buying up properties and using treated RO water for irrigation. (Once treated the water is 200ppm Sodium, they then add "associated water" with the fresh treated water to increase the Sodium levels back to 1000ppm EPA). The water is then used to irrigate soils already high in salinity.

- Rural and regional business operate on longer sustainability time frames – there needs to be consideration to the social, economic and natural resource legacy that will be left

long after CSG harvesting of 20-30years . Has the social impact from the potential loss of existing industries and ultimately community as a result of coal seam gas extraction been considered? Some businesses and towns simply cannot exist without bore water. Does the CSG industry have the economical capacity to make good in the event of cumulative far reaching damage to groundwater?

SUMMARY

Coal seam gas extraction in the Surat Basin, Queensland presents long-term ground water sustainability concerns under current state government policy regimes. The sheer volume of water predicted to be removed from the Great Artesian Basin over the next 20-40 years should be sending shock waves to bore water users, small business, towns, communities and the Queensland people. The P&G Act 2004 giving CSG companies unlimited water take in the process of gas extraction does not comply with the National Water Initiative where all governments of Australia are committed to a 'whole of water cycle' approach.