20/05/2017

To: the NSW Department of Planning and Environment This is a submission to the Narrabri Gas EIS.

Protect our Water, Environment and Rights (POWER) objects to this project. The EIS asks more questions than it answers.

Significant concerns about the Santos EIS.

a) the general level of uncertainty associated with this eis, and the inability of Santos to accurately quantify their impacts over the life of their projects (approximately 30 years);
b) the DoP can not make decisions based on unsubstantiated modelling that is totally inconsistent in finding from both the Queensland and overseas experience; No-one can make decisions on an EIS that consists of future management plans that do not exist yet.
c) the potential for significant impacts on Stygofauna;
d) the volume of groundwater to be co-produced with CSG, particularly:
    i. impacts on groundwater systems and their structural integrity,
    ii. pressure and volume impacts on GAB aquifers;
    iii. changes to the water chemistry of GAB aquifers;
    iv. the very significant recovery times for groundwater systems to return to pre-CSG conditions once extractive operations cease,
    v. the volume of salts and heavy metals associated with CSG co-produced water, and the uncertainty around their disposal, and
    vi. impacts on surface water hydrology from the discharge of CSG co-produced water into Bohena Creek and the Namoi River;
    vii. future reinjection of CSG water.
e) land subsidence;
f) impacts on highly productive agricultural land;
g) impacts on Indigenous cultural and spiritual values;
h) the detrimental effects and division of the community.

- The media release regarding the submission of Santos EIS raises the first questions regarding the EIS. Santos is very good at 'wordsmithing' and providing reassuring statements without actually providing any information. Examples are highlighted:

"1 February 2017 Narrabri Gas Project Environmental Impact Statement submitted.
Santos today submitted the State Significant Development Application and associated Environmental Impact Statement (EIS) for its Narrabri Gas Project to the NSW Department of Planning and Environment. The proposed Narrabri Gas Project, located in North West NSW, could supply up to 50% of NSW gas needs and provide significant benefits to the region and the state more broadly. Santos will make the gas (how much?) available to NSW and the east coast domestic market via a pipeline linking into the existing Moomba to Sydney Pipeline. The pipeline will be constructed by APA Group and will be subject to a separate approval. Santos' Managing Director and Chief Executive Officer, Kevin Gallagher, said Santos has spent time producing a comprehensive EIS so the local Narrabri community and stakeholders can be confident the environment and water will be protected as the Project is developed. "The EIS has concluded the Project can proceed safely with minimal and manageable risk to the environment," Mr Gallagher said. "The Narrabri Gas Project has the potential to play a significant role in the domestic energy space. Natural gas has a vital role to play in delivering energy security, whilst having the additional benefit of being 50% cleaner than coal resulting in a significant reduction in carbon emissions. The development of new natural gas resources is crucial in assisting Australia's move towards a clean energy future. "In NSW alone, more than one million homes and 33,000 businesses rely on natural gas as a source of energy." The NSW Government estimates the top 500 industrial gas users provide more than 300,000 jobs which rely on an affordable, secure supply of natural gas and has recognised the project's significance, declaring it a Strategic Energy Project. The Project could create about 1300 jobs during the initial construction phase and around 200 ongoing jobs, many of which will be locally based.
This just asks more questions than the EIS supplies.

- The government can't afford to cap less than 250 bores still uncapped in NSW alone. Who will ever be able to cap thousands of bores when Santos has long gone and they all need recapping. 7% of bores fail initially, 30% within 20 years and 100% within 100 years. Bores do not last 'forever' as stated by Santos. Concrete and metal

do not have a perpetual lifespan. This damage is permanent. Over time it will be like a pincushion with rusting pins. Who is liable for maintenance in perpetuity? Will it be the landowner? Farmers around the NGP have been told that once they accept payment from Santos they are liable for any problems into the future. Estimated costs of replacement and current values of water used per dependent sector are contained in the report "Economic output of groundwater dependent sectors in the Great Artesian Basin." (appendix 1)

- "The EIS found the project will have minimal risk of impact on agricultural and domestic water sources". Queensland has shown this is not the case. Broadacre Farming and agriculture can not co-exist. Does Santos still stand by this claim when they extend into their neighbouring PEL's and find a different type of landuse such as broadacre, intensive and irrigated farming. Currently Santos have 3 petroleum title applications that have been pending since 2014. All Santos single and joint venture current petroleum licenses have been expired between 22/10/2011 until now. If they don't plan to expand into the surrounding PEL's they currently hold why have they not released the expired licenses. Why has the government not cancelled these licenses? (appendix 2)

- All the Chief Scientist recommendations have not all been met.

- The report "The Economic Contest Between Coal Seam Gas Mining and Agriculture on Prime Farmland: It May be closer than We Thought' shows that "the long term economic net benefits from agriculture-only exceed those from CSG-only and CSG-agriculture-agriculture coexistence." Please read this report as part of this submission. (appendix 3)

- "Due to the geology of the deep coal seams, hydraulic fracturing will not be needed to extract the gas and Santos is not seeking approval to use this technology." Why did Eastern Star Gas need to frack when they owned the licence? Does the fact 'Santos is not seeking approval to use this technology' mean they will never frack no matter what? A change of management or shareholder pressure will never mean fracking is on the table? Will it be written into any sale contract that the purchaser can't frack? What legal stipulation will ensure they don't change their mind?

- Artesian Bore Water Users Association Of NSW Inc. has commissioned a report into the Stygofauna population in the Pilliga. Due to the time consuming task of data collection and analysis this report is not yet completed. We will forward a copy of the report as an annexure to this submission when we receive it.

Dr Peter Serov has previously completed a report for a private individual which I can not include but details are as follows:

ABC

Ancient stygofauna could halt Santos' Pilliga coal seam gas project

By Catherine Clifford and ABC Online staff

Updated 12 Jul 2013, 11:42pm

PHOTO: Stygofauna are blind, colourless and they've been around for millions of years. (Supplied)

A microscopic collection of worms and mites could play havoc with Santos' biggest coal seam gas project in the New South Wales Pilliga State Forest.

The ancient, subterranean creatures that live deep in an underground aquifer are only one millimetre long and thinner than a human hair.

They are known as stygofauna and they play an important role in filtering and determining the quality of groundwater.

The new evidence about the stygofauna is contained in one of 1,800 submissions to the Federal Government opposing Santos' plans to drill 18 gas wells in the Pilliga State Forest near Narrabri.

Santos had estimated the project could supply 25 per cent of New South Wales' gas needs.

The Government will now use its recently-passed "water trigger" laws to determine if Santos can go ahead with the drilling.

Hydro-biologist Dr Peter Serov, who found the two new species of stygofauna, says the creatures could be at risk because they are extremely sensitive to changes in water quality.

"There needs to be a lot more rigorous sampling and monitoring of both water chemistry and biodiversity across the region to determine what the ultimate ranges of these species are and what their environmental requirements are at this point in time," he said.

Blind, clear, subterranean creatures

PHOTO: There are calls for more research to be done on the stygofauna. (Supplied)

Dr Serov says stygofauna are highly specialised organisms that have been around for hundreds of millions of years.

"They are a group that have adapted over millions of years to occupy a very, very specialised niche," he said.

"Initially all of them would have been surface invertebrates, but due to the vast changes that the environment of Australia has gone through... they have colonised the subterranean environment and over time they've developed their own body forms to actually live exclusively in this situation."

"They have no colouration, they're usually totally clear or white, they have no eyes, they have specialised sensory organs that enable them to determine whether they're going up or down," Dr Serov said.

But Santos groundwater expert, Dr Peter Hancock, says he wants to know just where the tiny animals were found.

He says they may not exist in the deep aquifers that coal seam gas wells drill down to.

"The deeper coal seam aquifers are unlikely to have stygofauna in them. It's the shallow alluvial aquifers that are most likely to have them," he said.

But retiring New England Independent MP, Tony Windsor, who introduced the water trigger laws, says the scientific process must go ahead before the coal seam gas company moves in.

"We don't fully understand the scientific nature of some of these groundwater systems and until we do at a scientific level, I think the political process should step back and the industry process should step back until we get the science right and then make the decision," he said.

http://www.abc.net.au/news/2013-07-12/4815736

- Re-injection of CSG Water – will this rear it's head when one of the management plans mentioned in the EIS are made up?

Research into re-injection of CSG water.

Release Date: MARCH 1, 2017

New USGS maps identify potential ground-shaking hazards in 2017 from both human-induced and natural earthquakes in the central and eastern U.S.

Damage to buildings in Cushing, Oklahoma from the magnitude 5.0 earthquake on November 6, 2016. Unreinforced brick and stone masonry buildings and facades are vulnerable to strong shaking. Photograph credit: Dolan Paris, USGS

New USGS maps identify potential ground-shaking hazards in 2017 from both human-induced and natural earthquakes in the central and eastern U.S., known as the CEUS. This is the second consecutive year both types of hazards are forecasted, as previous USGS maps only identified hazards from natural earthquakes. This research was published today in Seismological Research Letters.

Approximately 3.5 million people live and work in areas of the CEUS with significant potential for damaging shaking from induced seismicity in 2017. The majority of this population is in Oklahoma and southern Kansas.

Research also shows that an additional half million people in the CEUS face a significant chance of damage from natural earthquakes in 2017, which brings the total number of people at high risk from both natural and human-induced earthquakes to about 4 million.

“The good news is that the overall seismic hazard for this year is lower than in the 2016 forecast, but despite this decrease, there is still a significant likelihood for damaging ground shaking in the CEUS in the year ahead,” said Mark Petersen, chief of the USGS National Seismic Hazard Mapping Project.

The 2017 forecast decreased compared to last year because fewer felt earthquakes occurred in 2016 than in 2015. This may be due to a decrease in wastewater injection resulting from regulatory actions and/or from a decrease in oil and gas production due to lower prices.

Despite the decrease in the overall number of earthquakes in 2016, Oklahoma experienced the largest earthquake ever recorded in the state as well as the greatest number of large earthquakes compared to any prior year. Furthermore, the chance of damage from induced earthquakes will continue to fluctuate depending on policy and industry decisions, Petersen noted.

“The forecast for induced and natural earthquakes in 2017 is hundreds of times higher than before induced seismicity rates rapidly increased around 2008,” said Petersen. “Millions still face a significant chance of experiencing damaging earthquakes, and this could increase or decrease with industry practices, which are difficult to anticipate.”

Important Note: In the west, USGS scientists have focused on the hazard from natural earthquakes. Induced earthquakes have been observed in California as well, but they don’t significantly change the regional hazard level, which is already high due to frequent natural earthquakes.

What are Induced Earthquakes?

Induced earthquakes are triggered by human activities, with wastewater disposal being the primary cause in many areas of the CEUS. Wastewater from oil and gas operations can be disposed of by injecting it into deep underground wells. Injected fluids cause pressure changes that can weaken a fault and therefore bring it closer to failure. Most injection wells do not trigger felt earthquakes, suggesting that a combination of many factors contribute to such events.

“By understanding the relationship between earthquakes and wastewater injection, informed decisions can be made on processes such as controlling the volumes and rates of wastewater injected and determining which wells are most susceptible to inducing earthquakes,” said Petersen.

Many questions have been raised about hydraulic fracturing—commonly referred to as “fracking”—and more information can be found by reading common questions.

States with High Hazard

The maps indicate an especially high ground-shaking hazard in five areas of the CEUS in 2017. These same areas were identified in the 2016 forecast.

Induced seismicity poses the highest hazard in two areas, which are Oklahoma/southern Kansas and the Colorado/New Mexico area known as the Raton Basin. In those areas, there is a significant chance that damaging levels of ground motion will occur in 2017.

Enhanced hazard from induced seismicity was also found in Texas and north Arkansas, but the levels are significantly lower in these regions than that forecasted for 2016. While earthquakes are still a concern, scientists did not observe significant activity in the past year, so the forecasted hazard is lower in 2017.

There is also a high hazard for natural earthquakes in the New Madrid Seismic Zone. The NMSZ is the only one of the five identified areas that has not experienced induced earthquake activity. The NMSZ had a higher rate of natural earthquakes in the past three years, leading to a slightly higher hazard potential compared to previous years in portions of Arkansas, Missouri, Illinois, Kentucky and Tennessee.

“The 2016 forecast was quite accurate in assessing hazardous areas, especially in Oklahoma,” said Petersen. “Significant damage was experienced in Oklahoma during the past year as was forecasted in the 2016 model. However, the significantly decreased number of earthquakes in north Texas and Arkansas was not expected, and this was likely due to a decline in injection activity.”

“There is specific concern in parts of the central U.S. since the forecasted hazard levels are higher than what is considered in current building codes, which only incorporate natural earthquakes,” said Petersen.

People living in areas of higher earthquake hazard should learn how to be prepared for earthquakes. Guidance can be found through FEMA’s Ready Campaign.

USGS charts showing the number of earthquakes greater than or equal to magnitude 2.7 since 1980 in the five focus areas identified as having especially high ground-shaking hazard in the central and eastern U.S. in 2017.

Spotlight on Oklahoma

Between 1980 and 2000, Oklahoma averaged about two earthquakes greater than or equal to magnitude 2.7 per year. However, this number jumped to about 2,500 in 2014, 4,000 in 2015 and 2,500 in 2016. The decline in 2016 may be due in part to injection restrictions implemented by the state officials. Of the earthquakes last year, 21 were greater than magnitude 4.0 and three were greater than magnitude 5.0.

USGS research considers a magnitude 2.7 earthquake to be the level at which ground shaking can be felt. An earthquake of magnitude 4.0 or greater can cause minor or more significant damage.

The forecasted chance of damaging ground shaking in central Oklahoma is similar to that of natural earthquakes in high-hazard areas of California.

“Most of the damage we forecast will be cracking of plaster or unreinforced masonry. However, stronger ground shaking could also occur in some areas, which could cause more significant damage," said Petersen.

Protecting Communities

The new report is valuable for making informed decisions to reduce the nation’s vulnerability and providing safety information to those who may be at risk from strong shaking. For example, the 2016 forecast has been used by engineers to evaluate earthquake safety of buildings, bridges, pipelines and other important structures. Risk modelers have used data in developing new risk assessments, which can be used to better understand potential impacts on insurance premiums. The U.S. Army Corps of Engineers has used the information to provide guidance on updating their safety assessments of selected facilities.

Continuing collaborations between regulators, industry, and scientists will be important toward reducing hazard, improving future forecasts, and enhancing preparedness.

Central versus Western U.S.

In recent years, the CEUS has experienced a significant increase in induced earthquakes. Therefore, in the 2017 and 2016 forecasts, scientists distinguish between human-induced and natural seismicity only for the CEUS. Scientists also used a historical catalog of seismic events dating back to the 1700s, putting a strong emphasis on earthquakes that occurred during the last 2 years.

Future research, noted Petersen, could take a more detailed look at induced seismicity in the west, including in California at The Geysers, Brawley and small areas of the Los Angeles Basin.

Distinguishing Between Induced and Natural Earthquakes

To determine whether particular clusters of earthquakes were natural or induced, the USGS relied on published literature and discussions with state officials and the scientific and earthquake engineering community. Scientists looked at factors such as whether an earthquake occurred near a wastewater disposal well and whether the well was active during the time the earthquakes occurred. If so, it was classified as an induced event.

One-Year Outlook

The one-year outlook is chosen because induced earthquake activity can increase or decrease with time and is subject to commercial and policy decisions that could change rapidly. The 2016 and 2017 forecasts employ identical methodologies; the only difference is that the 2017 forecast includes an updated earthquake catalog with 2016 events. This allows for a direct comparison from one year to the next.

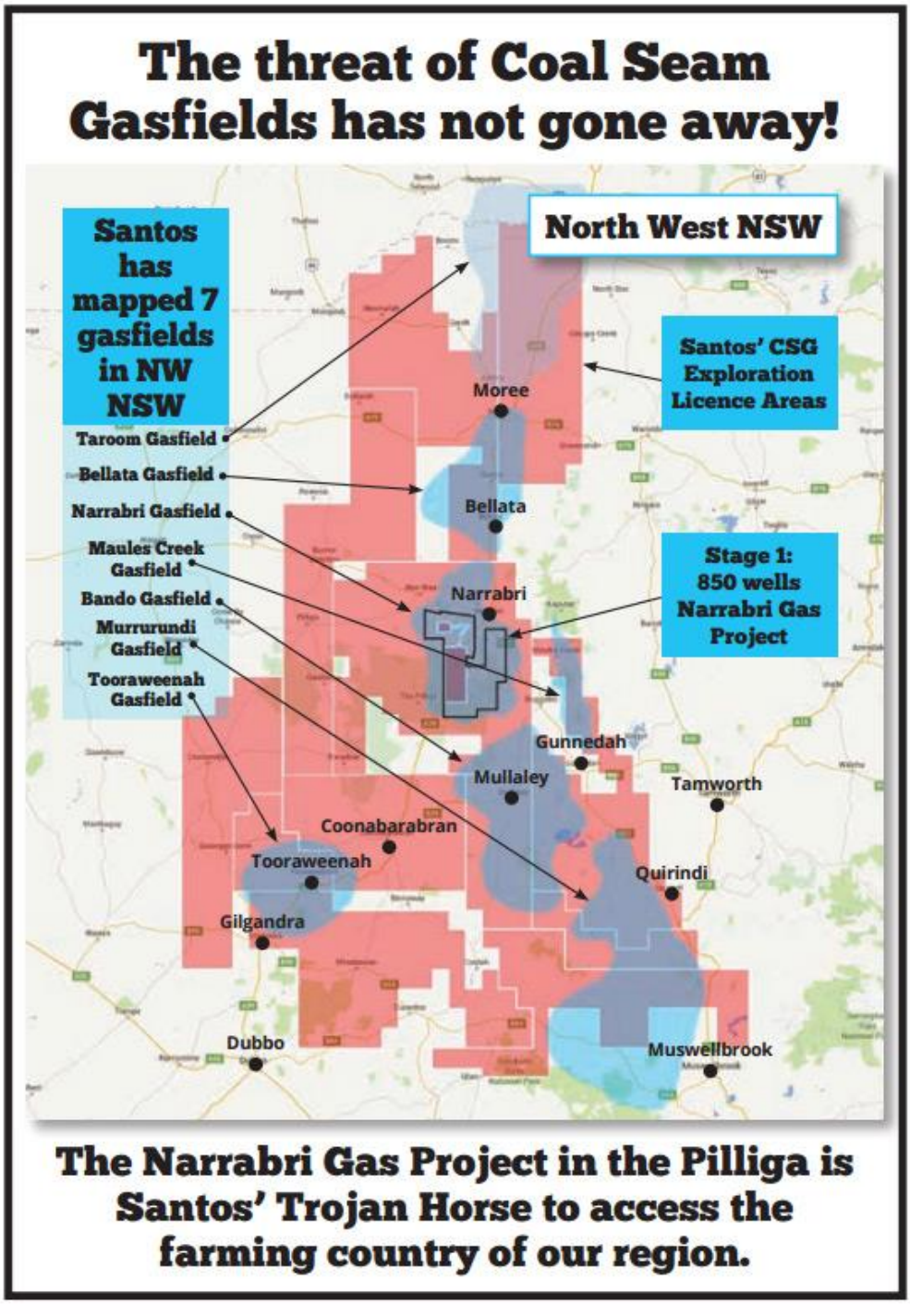
In contrast, the USGS National Seismic Hazard Map assesses natural earthquake hazards and uses a 50-year forecast. That timeframe was chosen because that is the average lifetime of a building, and such information is essential to engineering design and the development of building codes.

USGS Science

The USGS is the only federal agency with responsibility for recording and reporting earthquake activity nationwide and assessing seismic hazard. These maps are part of USGS contributions to the National Earthquake Hazards Reduction Program, which is a congressionally established partnership of four federal agencies with the purpose of reducing risks to life and property in the United States that result from earthquakes.

https://www.usgs.gov/news/new-usgs-maps-identify-potential-ground-shaking-hazards-2017

- How can an EIS be submitted with whole sections that are incomplete? With approximately 16 Management Plans mentioned in the EIS Santos obviously do not have a comprehensive plan for what they propose to do in the NGP. How can the public comment on something that is developed AFTER approval? Will this include re-injection, change to the no-fracking 'plan'?



It should be a statutory requirement that Santos explain the extent of their future plans and these should be treated cumulatively. The future effects will be cumulative.

- Well integrity
  No-one can claim, as Santos has, well integrity in perpetuity. Concrete and casing do not last forever. The following photos prove this.

Eastern Star Gas Bohena #2 – disused, not rehabilitated and badly deteriorating due to salt and/or leaking methane.
Less than 15 years old. July 2011

Corrosion on a fitting just over 12 months old. Kenya gasfield Qld

There is not enough known about this industry and the effects it has on the environment. If the gas isn't going anywhere why the rush. Ensure it is safe and not going to permanently damage the GAB.

Clean water is our constitutional right

POWER

Protect our Water, Environment and Rights.