Submission No 24

INQUIRY INTO THE IMPLEMENTATION OF THE RECOMMENDATIONS CONTAINED IN THE NSW CHIEF SCIENTIST'S INDEPENDENT REVIEW OF COAL SEAM GAS ACTIVITIES IN NEW SOUTH WALES

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Dr Keith Fleming

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Thank you for the opportunity to submit comments to this *Inquiry*.

The NSW Chief Scientist (Mary O'Kane) submitted her *Recommendations resulting* from *her Review of Coal Seam Gas Activities in New South Wales*, September 30, 2014. However, after 5 years the NSW Government has failed to enact and implement ***all*** of the *Recommendations* including 4, 5, 6, 9, 10, 11, 12 and 13. Until ALL *Recommendations* are fully implemented, and this includes additional *Recommendations* identified from your present study fully enacted and successfully implemented, **NO** coal seam gas (CSG) projects, including 'legacy' Petroleum Exploration Licenced projects, should be progressed in this State.

My expertise is in chemistry, with an applied interest in environmental issues. My comments will be restricted to my strengths. Not all *Recommendations* will be considered.

COMMENTS

I believe the following *Recommendations* have either not been enacted, or fully implemented by the NSW Government.

Recommendation 4

That the full cost to Government of the regulation and support of the CSG industry be covered by the fees, levies, royalties and taxes paid by industry, and an annual statement be made by Government on this matter as part of the Budget process.

As of October 9, 2019, *Recommendation 4* had not been implemented. This was evidenced by the Deputy Premier's inability to provide a response to Supplementary Questions concerning *Recommendation 4*, or to confirm that the Government had received a report and Budget submission for items identified in Recommendation 4.

Is it true that Santos is presently using gas from its Narrabri exploration wells to produce electricity, but not paying royalties? If true, this would appear contrary to the inclusions in *Recommendation 4,* or is Santos able to not pay royalties because the Government has not implemented *Recommendation 4?*

Recommendation 5

That Government use its planning powers and capability to designate those areas of the State in which CSG activity is permitted to occur

I note that a number of exclusions have been applied along the eastern seaboard but not to other significant areas of NSW. When does the Government intend using its powers to protect the Great Artesian Basin's (GAB's) significant recharge conduit below Santos' planned Narrabri gas project? In the present drought conditions, the critical importance of subsurface water for all life is being exemplified.

The Government's reluctance to apply Recommendation 5 to the Narrabri Gas project is bewildering.

Recommendation 10

That Government commission the design and establishment of a Whole-of-Environment Data Repository for all State environment data including all data collected according to legislative and regulatory requirements associated with water management, gas extraction, mining, manufacturing, and chemical processing activities. This repository, as a minimum, would have the characteristics that it:

- **is accessible by all under open data provisions;**
- **has excellent curatorial and search systems;**
- **houses long-term data sets collected as part of compliance activities;**

•can accept citizen data input;
•can be searched in real time;
•is spatially enabled;
•is able to hold data in many diverse formats including text, graphics, sound, photographs, video, satellite, mapping, electronic monitoring data, etc., with appropriate metadata;
•is the repository of all research results pertaining to environmental matters in NSW along with full details of the related experimental design and any resulting scientific publications and comments;
•is the repository of historical resources data with appropriate metadata. Various legislative amendments or other incentives will be needed to direct all environment data to the Repository.

Recommendation 10 has not been fully implemented as demonstrated by the Deputy Premier's inability to provide answers on notice to questions concerning inclusions in *Recommendation 10*. Implementation of the SEED website is clearly NOT USER FRIENDLY for I have not been able to access any data on that website for the Santos' Narrabri pilot gas project.

To achieve *Recommendation 10's* transparency implications (e.g. Dot point 1: ***is accessible by all under open data provisions***) all required data must be transferred from the onsite monitors in 'real time', unfiltered by the supplying industry, to the designated retrieval site (such as a *user friendly* SEED site). The data must not be withheld by the supplying industry under a 'commercial in confidence' veil of secrecy to enable the reviewing 'Independent Expert Scientific Committee', and the public, the opportunity to view the real data.

The Government's failure to fully implement *Recommendation 10* is a critical omission for this *Recommendation* impinges on *Recommendations 2, 8, 10, 11, 12 and 13.*

Recommendation 12

That Government establish a standing expert advisory body on CSG (possibly extended to all the extractive industries). This body should comprise experts from relevant disciplines, particularly ICT and the earth and environmental sciences and engineering, but drawing as needed on expertise from the biological sciences, medicine and the social sciences. The prime functions of this expert body would be to advise Government:

•on the overall impact of CSG in NSW through a published Annual Statement which would draw on a detailed analysis of the data held in the Whole-of-Environment Data Repository to assess impacts, particularly cumulative impacts, at project, regional and sedimentary basin scales
•on processes for characterising and modelling the sedimentary basins of NSW
•on updating and refining the Risk Management and Prediction Tool

•on the implications of CSG impacts in NSW for planning where CSG activity is permitted to occur in the State on new science and technology developments relevant to managing CSG and when and whether these developments are sufficiently mature to be incorporated into its legislative and regulatory system

•on specific research that needs to be commissioned regarding CSG matters

•on how best to work with research and public sector bodies across Australia and internationally and with the private sector on joint research and harmonised approaches to data collection, modelling and scale issues such as subsidence

•on whether or not other unconventional gas extraction (shale gas, tight gas) industries should be allowed to proceed in NSW and, if so, under what conditions

The NSW Government's failure to implement Recommendation 12 is deplorable in the light of Santo's proposed Narrabri gas project application. Precise modelling of the rock strata, fault lines and aquifers are essential precursors for a decision on Santos' Narrabri gas project application. The standing expert advisory body on CSG must include specialists with gas section experience, such as reservoir engineering and modelling, for Recommendation 12 to be achieved.

I recommend *Recommendation* 12 be fully reviewed and implemented with the expert advisory body on CSG, including experienced experts in CSG extraction.

Recommendation 13

That Government establish a formal mechanism consisting of five parallel but interacting steps. The five steps are given below.

•Companies or organisations seeking to mine, extract CSG or irrigate as part of their initial and ongoing approvals processes should, in concert with the regulator, identify impacts to water resources, their pathways, their consequence and their likelihood, as well as the baseline conditions and their risk trigger thresholds before activities start. These analyses and systems should be incorporated in project management plans to meet regulator-agreed targets. Appropriate monitoring and characterisation systems would be developed as part of these project management plans and then installed. The monitors would measure baseline conditions and detect changes to these, as well as providing data on impacts and triggered risk thresholds.

•Data from the monitors should be deposited (either automatically or in as close to real time as possible) in the State Whole-of-Environment Data Repository by all the extractive industries. Increasingly automated tools to interrogate data in the Repository should be developed, and these used to search data for discontinuities and compliance alerts.

•As a separate process, the expert advisory body would examine on a frequent basis all data relevant to a region or a sedimentary basin. This data would come from a range of sources (the companies' monitoring data along with triangulation/cross-validation data such as that from satellites, reports from local councils, seismic data, subsidence maps, information from cores, etc.). The expert body would use this data

review to check for any factors signalling problems in that region and, if any are found, recommend to Government the appropriate action to be taken with regard to the relevant parties.

- **In a parallel process, the Government should commission, construct and maintain a variety of models of each region and in particular one that seeks to address cumulative impacts. These models should feed into the land use planning process and the activity approvals processes, and should assist in target setting for new projects.**
- **Government, working with other appropriate Australian governments, should commission formal scientific characterisation of sedimentary basins starting with the East Coast basins, and concentrating initially on integration of groundwater with the geological, geophysical and hydrological context. Viewing these integrated systems in models and in interpretation could be described as a 'Glass Earth' approach to understanding the dynamics of activities and impacts in the basins.**

Recommendation 13 has not been implemented. For example, Dot point 1 requires that a company seeking to mine gas must, **'in concert with the regulator, identify impacts to water resources, their pathways, their consequence and their likelihood, as well as the baseline conditions and their risk trigger thresholds before activities start.'**

I have seen no evidence that this has been done to support Santos' Narrabri gas project application.

Baseline conditions *before* gas extraction commences are essential to measure change. I have been unable to find, or access full and useful baseline data for Santos' Narrabri gas project. For example, with regards to water in Santos' Narrabri gas project application:

> How many monitors are planned across the proposed Narrabri gas project?
> At what depths are these monitors to be positioned?
> In what pattern and at what depths are the monitors to be placed around each well and well-head, and around the entire gas field?
> What buffer zone is to be fully monitored?
> What substances are proposed to be monitored?
> How are the data to be recorded and transferred to the **Whole-of-Environment Data Repository (***Recommendation 10***)**

If change is to be meaningfully reviewed by the expert body, an accessible and reliable baseline, with subsequent data, is crucial.

To date I have not been able to access from the SEED website any data emanating from the Santos' Narrabri pilot gas project.

(I realise such specific detail is not included in broad Recommendations. However, as a meaningful baseline and subsequent data do not appear to exist for Santos' pilot Narrabri gas project, I recommend that the provision of the required data not be left to industry to decide what data and when it will be transferred to the SEED website. This would defeat the purpose of *Recommendation 10.)*

Omissions

A number of omissions appear to have not been included in the NSW Chief Scientist's *Recommendations.* Because of the significance of these issues, this inquiry should ensure that omissions are included in the amended *Recommendations* list.

These omissions include impacts on **methodology**, **heath**, **climate change and water**.

Methodology

Extraction methodology must be *safe into perpetuity* to protect the environment, all of its life forms (including humans), surface and subterranean levels (including the Great Artesian Basin (GAB)) from contamination. The importance of the GAB for the future of all living things in a proposed mining area cannot be over emphasised. Gas well construction materials that are *designed to fail* at some time before, or after the mining life of the gas field is completed are unacceptable for they would provide a transfer path for contaminants between aquifers, including the GAB, in Santos' Narrabri gas project 's case. Before a proposed gas field mining application is approved the safety of the methodology MUST be demonstrated permanently SAFE into the future. Gas well failure cannot be left to insurance for repairs only within the life of the gas field. Failure must be prevented at the design stage, through the use of SAFE materials, which will be safe for the life of the mine and throughout perpetuity. Anything less would threaten, or destroy some, or all life in the affected region into the future. In the case of Santos' proposed Narrabri gas project, the GAB recharge aquifer could be contaminated, and irreversibly damaged, affecting the major GAB itself. The effect on bores accessing this contaminated aquifer could be terminal.

The Chief Scientist's Recommendations do not appear to include the very basic Methodological Safety standards as a necessary and essential requirement. I strongly urge the inclusion of Methodological Safety standards in the Chief Scientist's list of *Recommendations*.

Human Heath Aspects

Although few reliable peer reviewed health studies based on Australian data have been published, extensive international research has shown elevated health risks for humans working in the industry, as well as for populations living in close proximity to a CSG gas field work site. Health issues associated with CSG extraction cannot, and should not be ignored.

Health aspects (and not only Human Health) cannot be ignored and must be included within the Chief Scientists Recommendations List.

Climate Change

We are living in a period of natural geological earth warming. Anthropogenic activities since the beginning of the Industrial Revolution (late 18th Century) have greatly accentuated the rate of temperature increase. The increased rate of temperature increase is a direct reflection of greenhouse gas emissions increase. Primary contributors to greenhouse gas activity include CO_2 and CH_4 concentrations, both products of CSG mining

and product use. The greatest source of CO_2 is the combustion of carboniferous fuels, particularly coal, coal gas (including CSG), and oil.

I believe the omission of the effect of mining and using CSG on the earth's climate is a critical failure in the Chief Scientists' Recommendations list and I strongly encourage the effect of extracting and using fossil fuels on our future climate to be included in that list.

Water

Australia may be the driest continent on earth, and this should be a reason for conserving water and using it wisely. The Barwon electoral region, which includes Narrabri and the Santos' Narrabri gas project, is presently in drought. Many communities are dependant for water from subterranean resources for their crops, stock and personal hygiene. Mining CSG demands vast volumes of water. Much of this water, laced with noxious chemicals, is pumped into the target rock layers to facilitate the release of CSG from the rock and lubricate the gas flow to the surface. Much of this water remains in the target rock region whilst some of this water returns to the surface with the released gas. Some waste water and fugitive gas escape from the target area through fractured rock strata. Fractured cap rock, caused by strata slumping under reduced pressures, further facilitates the release of waste water and fugitive gas. These wastes will percolate upwards towards the surface, contaminating aquifers through which they pass, as well as contaminating surface conduits. In the Narrabri Gas proposal, fractured rocks below target seams will facilitate waste water entering and contaminating lower layers. This contamination is PREDICTABLE, and the contamination of the southern recharge zone for the GAB is possible.

Fugitive gas escaping from cracked capping rock will find its way into the atmosphere. Fugitive gas contains carcinogens, teratogens, neurotoxins and other noxious contaminants. Health risks to workers as well as human and other animal populations, plants and other living species living in close proximity to CSG work sites are therefore highly predictable.

The identification of water issues, and the development of standards are essential inclusions in the Chief Scientists' Recommendations List.