NSW GOVERNMENT Trade & Investment

Troy Delghton <troy.delghton@chiefscientist.nsw.gov.au>

FW: Environmental Health Impact Assessment for Stage 3 of the Camden Gas Project

Jocelyn Kramer <jkramer@carmelvarroville.org.au> 11 June 2014 11:52
To: troy.deighton@chiefscientist.nsw.gov.au

Troy,

I forward this for your information, in case my message of 4 June did not reach Professor Mary O'Kane.

Kind regards,

Jocelyn Kramer

(Sister) Jocelyn Kramer OCD

Carmelite Nuns

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Varroville 2566 NSW

From: Jocelyn Kramer [mailto:jkramer@carmelvarroville.org.au]
Sent: Wednesday, 4 June 2014 4:39 PM
To: 'nswchiefscientist@chiefscientist.nsw.gov.au'
Subject: Environmental Health Impact Assessment for Stage 3 of the Camden Gas Project

Professor Mary O'Kane

Chief Scientist, NSW

4 June 2014

Dear Professor O'Kane,

In November 2013, Mike Moraza, Group General Manager Upstream Gas, AGL Energy Limited, kindly sent me a copy of the Environmental Health Impact Assessment (EHIA) for the proposed Northern Expansion of the Camden Gas Project. He asked for my feedback on it.

In April 2014, after carefully studying the EHIA, I sent Mr Moraza my review and copied it to Professor Wayne Smith, of the Environmental Health Branch at NSW Health and to Jackie Wright of Environmental Risk Sciences (EnRiskS) who undertook the Assessment. None of these has acknowledged receipt of my review.

I now send a copy to you, as it will supplement the submissions we have already made to your Coal Seam Gas review. Perhaps it will be of some use as you prepare your final report.

Kind regards,

Jocelyn Kramer

Sister Jocelyn Kramer OCD

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[redacted]

Environmental Health Impact Assessment review.pdf
472K

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Mr Mike Moraza
Group General Manager Upstream Gas
AGL Energy Limited
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Email: mmoraza@agl.com.au

9 April 2014

Dear Mr Moraza,

Re: Environmental Health Impact Assessment for the proposed Camden Northern Expansion Project

In November 2013 you kindly sent me a copy of the Environmental Health Impact Assessment (EHIA) for the Camden Northern Expansion Project. I have now finished reading the Assessment and am writing, as requested, to offer you my feedback on it.

The report is clearly written. I found it useful to be provided with additional detail about the process of coal seam gas (CSG) extraction and the chemicals used. The new information raises some questions which I shall detail later in this response.

You mentioned in your letter that, to your knowledge, this report is the first of its type. That being so, I am acutely aware that it is likely to be used as a precedent and template for future CSG projects in urban areas. Therefore, I felt it was important to scrutinise it carefully.

Having studied the EHIA in detail, I feel that the community's concerns about the health impacts of CSG extraction by AGL in its proposed Northern Expansion of the Camden Gas Project (CGP) will not be allayed. In fact, I would go so far as to question whether AGL and NSW Health have even *heard* the community's concerns expressed at Community Information Evenings in 2013 and in written submissions.

General observations

Narrow focus of EHIA

I understand that AGL commissioned a *screening level* environmental health impact assessment (p.1). The overall objective of the EHIA is to provide a structured assessment of potential impacts associated with the proposed Camden Northern Expansion Project on the health of the surrounding community. 'The assessment has addressed the potential for adverse health impacts associated with the Northern Expansion Project only, based on site-specific and project-specific information' (p.1). 'The focus of the EHIA relates to impacts to the environment that include air, water and noise.

Ecological, political, visual, economic, traffic and social impacts are not addressed in this assessment' (p.1, 2). Environmental Risk Sciences Pty Ltd has provided no justification for narrowing the focus of the EHIA to exclude these factors, which are of major concern to the public. Was this EnRisks brief from AGL? What role did NSW Health play in this decision?
Failure to listen to the community's concerns expressed at public meetings and respond to them constitutes a fundamental limitation of the EHIA. The community will want to know why these impacts are merely acknowledged in passing (p.28-9) and mostly not assessed, since they potentially affect health and wellbeing. It is unlikely that this well-educated community will accept having ecological, political, visual, economic, traffic, social, mental and psychological health impacts excluded from consideration. As it stands, much of the EHIA is answering questions the community is not asking while failing to address questions the community is asking.

The community is asking that AGL and NSW Health acknowledge that CSG extraction is a relatively new industry, that it has not been brought into urban areas before (specifically, into the Sydney Metropolitan Area), that there are many unknowns associated with CSG extraction, and that anecdotal observations and preliminary research reports from places where CSG extraction is well established have suggested the possibility of impacts, as yet unknown, upon human health. Merely defining the focus of the EHIA so narrowly that these points do not merit consideration does not lessen their legitimacy. Honest admission of the existence of unanswered questions and of the need for further research would indicate good faith on the part of AGL, quite apart from demonstrating understanding, appreciation and acceptance of sound scientific practice.

Methodology

The Introduction to the Report states that 'The EHIA… is a desk-top assessment i.e. it has not involved the collection of any additional data over and above that which has been provided from Project specific EA technical studies, or studies undertaken for existing operations within the CGP or community consultation' (p. 3).

'The scope of work associated with the conduct of the EHIA is:

- Review the available specialist/technical reports conducted as part of the EA for the Project.
- Collate available information to develop a community profile of areas potentially impacted by the Project. The profile includes the local community as well as the local environment...
- Conduct an EHIA where all the available information from the specialist/technical reports is assessed, the potential for impacts on the community are (sic) identified and assessed and relevant risk mitigation measures (that may be required) are identified and summarised.' (p.3)

The authors of the EHIA have assumed that the information provided in the specialist and technical reports is accurate, complete and up to date. They have relied heavily on the original EA and subsequent reports despite their many deficiencies, which have been pointed out in public submissions over the last 3 years. Their 'review' of the specialist reports appears to have been a mere reading rather than a 'critical review' seeking weaknesses and limitations. It is clear that they have undertaken a desk-top assessment, since they have failed to notice the fundamental fact that the description of the Project Area is inaccurate and out of date. The EHIA does not mention that the Project Area, located entirely within the Sydney Metropolitan Area, has urbanised rapidly since the EA of 2010. This fact alone underpins the need for a Health Impact Assessment.

There is minimal evidence in the EHIA (Section 3) that the second point in the scope of the work (shown above) has been undertaken. The total population of the Camden and Campbelltown LGA's provided from the 2011 census (Table 3.1, p. 26) is 202, 687 people. There is no information about current or projected population within the proposed Project Area during the life of the Project. What information constitutes the local environment profile specific to the Northern Expansion (Executive Summary)? What bearing have the profiles had on the conclusions of the EHIA?

The overview of the Risk Assessment Process (p.4-6), particularly Figure 1.1, clearly spells out the process. The first step is to engage the stakeholders, risk communication and community consultation, and from that process to identify key issues *amenable to risk assessment* (italics mine). Does this mean that issues too complex for risk assessment are not important? Perhaps they are crucial and the process of risk assessment is itself inadequate! Where in the EHIA have uncertainty analyses been provided? What evidence has been provided of 'review and reality check' depicted in Fig.1.1? Finally, how meaningful and accurate is the 'largely qualitative' (p.3) risk characterisation undertaken in the EHIA? Of course, if most risks are defined out of existence one does not have to proceed to the step of risk management, which involves evaluating 'the environmental health, economic, social and political aspects of the options' (Fig.1.1).

A case in point is the Assessment of Air impacts (Section 4) where the most recent data were not accessed by the authors. See detailed criticisms of this Section in point 4 (below).

Response to community consultation

The summary of key issues identified by the local community in relation to the proposed Project and listed on pages 28-9 is a selection of issues, observations and unsubstantiated assertions that merits careful consideration. The way the summary is presented, quoting verbatim statements rather than a value-free list of concerns, invites a dismissive response. The list does not do justice to the specific and substantial issues raised in public submissions. It appears that the Report's authors might merely have read AGL's responses to the submissions and not the submissions themselves.

Specific observations

1. On what grounds were ecological, political, economic, visual, traffic and social impacts excluded from the EHIA? (p.1-2)

2. **Section 2:** The Project Description is inaccurate, repeating the claim from earlier reports that the Surface and Subsurface Project areas are' largely rural'. No mention is made of the entire proposed Project area being within the Sydney Metropolitan Area (p. 8). The description is elaborated on p.26: 'The Northern Expansion encounters land ear-marked for future urban (residential, commercial and industrial) development and as such is likely to experience a change from a rural to an urban environment.' No mention is made of the fact that these developments are already well underway. Figure 2.2 (p.11) shows current and proposed new housing but the project description in the text does not reflect this reality. The EHIA does not seek to have the outdated maps (rather, graphics) from the 2010 EA corrected to reflect current and future development. It is not acknowledged that these developments underpin the public's concerns about health impacts in their widest sense.

Section 2.4-2.5 (Geology and hydrogeology): the language used in the text reveals a degree of uncertainty about the facts which is honest, but is also bound to add to the community's concerns. The following phrases are indicative: 'most of…'; 'tend to be (repeated)…'; 'relatively unaffected'; 'Very few, if any…'; 'The possibility cannot be ruled out…'; 'mostly…'; 'is inferred to be…'; 'suggests that…' (p.12). Further examples: 'is expected to occur (repeated)…'; 'There may be some minor leakage… however, by far the majority flow… is expected to occur…' (p.17).

Re drilling of horizontal wells (p.18-19): the description indicates that lateral drilling ('building angle') takes place over a considerable distance (perhaps 1300m?) in layers of rock above the target coal seam. No mention is made of the relevance (or otherwise) of this fact to penetration of aquifers and potential connectivity between them. Further information is needed.

It is stated that the horizontal drilling technique (which nevertheless involves an initial vertical component, the length of which is not specified) has eliminated the requirement for vertical wells and hydraulic fracture stimulation for the past 5 years in the CGP (p. 19). And yet, the EHIA mentions that hydraulic fracturing influences well construction (Appendix C, p.14) and might be required in the future (mentioned repeatedly). Hence much of the text has been devoted to an explanation of the procedure and the substances and chemicals used (p.20ff, passim and appendices). Are we to take it that hydraulic fracturing remains a feature of CSG extraction now and in the future?

Commissioning and Production (2.6.5): 'If the gas gathering network was not yet installed at this point, then gas flaring may be required' (p.22). No mention is made of the duration of flaring or of any impact on air quality, only that there would be no visual impact.

In-field compression (p. 24): the community's concerns about where this might be located and what it would involve have not been addressed. Since noise is an impact considered in the EHIA, the public has a reasonable expectation that the possibility of in-field compression would be given close attention in the Assessment. But this has not been done.

3. **Section 3:** Location of sensitive populations (3.2): yet again, despite repeated notification by us and by the Carmelite friars, the Carmelite monasteries and Retreat Centre at Varroville have not been identified as sensitive community populations (p.28). These monasteries are residential homes for their occupants.

   Distance from proposed CSG wells to residential homes (Table 3.2, p.27): we note that four well locations (RA03, CU26, CU22, CU31) could be within 50m of residential homes in the future. Does the EHIA consider that there would be no adverse health impact (e.g. noise) from one – or at worst case scenario – six wells co-located at such a short distance from residential homes? If so, on what evidence?

4. **Section 4: Assessment of Impacts – Air.** This section appears flawed. It begins (4.1) by repeating an inaccurate description of the Project area. It is vague and non-specific: e.g. which

facility is the ‘industrial park nearby’ (p.30)? How scientific is the assertion that ‘The air quality is expected to be quite good (sic)’? Section 4.2 reveals a serious limitation of this assessment: the data used are 6 years out of date (Table 4.1). Surely such an important study as the EHIA could request access to recent unpublished data from Campbelltown TAFE (p.30) to furnish NSW Health and the public with an up-to-date risk assessment?

During operations, three pollution sources are listed (p.31). No mention is made of gas leaks from well heads and gas gathering lines as a source of pollution. These leaks are mentioned in Section 4.4.2 under the heading Potential for Fugitive Emissions to Occur, where it is noted (p.35) that ‘there is little information available that is relevant for Australia and the most recent methodologies used in establishing wells’ (p.35). ‘Saddler (2012) recommended that a study be undertaken in Australia to provide data on which to base the National Guidelines’ (p.35). The reference to Saddler’s review of the literature is incomplete; full details need to be furnished.

We are referred to the PAE Holmes Greenhouse Gas Assessment (2010), which estimates (Appendix H, p.23) fugitive emissions from field operations to be ‘an immaterial amount’ – based on an assumption that all of the fugitive losses occur at the same spot (i.e. 1 well) at each well location (p.38). Is this assumption valid where up to six wells are co-located?

It is stated that the composition of gas received at the Rosalind Park Gas Plant is monitored continually (p.33). Are the wells and gas gathering lines monitored routinely for leaks? How often? It is stated later in the report that ‘AGL will inspect each well a minimum of once per week in accordance with best industry practice. Leak testing will also be undertaken on at least a 12-monthly basis, and more often if the well or pipeline is close to residential areas (p.55)’. How often is ‘at least’ a 12 monthly basis? How often is ‘more often’? How close is ‘close to’ residential areas? Since under the proposed Northern Expansion, all wells and most pipelines will be in the Sydney Metropolitan Area and in an area undergoing rapid urbanisation, an adequate health impact assessment must offer more than a vague assurance that sufficient monitoring will be undertaken.

Under the heading Hazards Associated with Methane (p.37) it is stated that there are no data to suggest increased sensitivity for children. Given the anecdotal reports from Tara in Queensland in recent years expressing health concerns for children living in areas where CSG extraction occurs, are steps being taken to undertake epidemiological studies to investigate these concerns? Absence of data does not indicate absence of risk.

The PAE Holmes Air Quality Impact Assessment 2010 (Appendix G) notes that ‘Campbelltown City Council has requested that the assessment includes measures to assess cumulative impacts of the proposed development on the ambient air quality of the region’ (p.2). We find no evidence in the EHIA that this request has been met.

5. **Section 5:** The specialist noise assessment survey ‘found that the existing noise was typical of a suburban area’ (p.42). We note that this contrasts with the description of the area as ‘largely rural’ in other sections of the report (e.g. p.8). It is stated that the NSW Construction Noise

Policy assumes that 'construction activity should only occur during the day Monday to Friday, during Saturday mornings and not at all on Sundays and public holidays' (p. 43). Yet, we are told by AGL that well construction (drilling) takes place 24 hours a day, 7 days a week for 3-5 weeks per well, so that for 6 wells co-located drilling would take over 6 months. This implies continuous construction noise for more than half a year for residents in the vicinity of well locations. The EHIA has not assessed the health impact of continuous construction noise.

As mentioned above (point 3), the Carmelite monasteries and Retreat Centre have repeatedly not been listed as sensitive populations within the Project Area. The revised assessment undertaken by SLR Consulting in response to the submissions received did not address the specific situation of these sensitive communities, instead deciding that 'Due to the remoteness of the location of VV03 from surrounding receivers a further noise assessment at this location was deemed not to be warranted at this time' (Addendum to Noise and Vibration Assessment Report, October 2012, p.1). This failure to monitor noise impacts from VV03 has been overlooked in the EHIA (Section 5.1). Therefore we do not know what health impacts might be expected for residents of the monasteries and for residential visitors to the Retreat Centre. As noted in our previous submissions, CSG extraction at VV03 will impact negatively on the amenity of the area and adversely affect the livelihood of the Discalced Carmelite friars, whose income relies upon attracting visitors to the Retreat Centre.

6. **Section 7.3:** This section discusses hydraulic fracturing in some detail. The text continues to allow for the possibility that hydraulic fracturing will be required, despite stating that the horizontal drilling technique 'has eliminated the requirement for vertical wells, and hydraulic fracture stimulation, for the past 5 years in the CGP (p.19).' Is it correct that the average fracture length is approximately 50 metres (p.51)? What is the *range* of fracture lengths that contributes to this average? If hydraulic fracturing is required in the future in horizontal wells, how meaningful is a fracture length of 50 metres relative to a drill path of 2500 metres? And, in the case of horizontal drilling, what is the risk of aquifer interconnectivity as the drilling builds angle before entering the target coal seam? This question has been overlooked in the EHIA. Yet it seems pertinent to ask this question given the admission that 'While there are no specific monitoring, controlled flow tests or test pumping data that demonstrates this degree of vertical connection or disconnection, inferences can be drawn from studies conducted elsewhere in the southern Sydney Basin, including impacts from long wall coal mining and nearby groundwater resource investigations (p.51).' Are such 'inferences' valid?

   Again, in the cautionary paragraph stating that 'It is important that hydraulic fracturing operations be conducted remotely from known cross cutting features such as faults and volcanic intrusions… such cross cutting features could, in some circumstances potentially act as conduits for fractures and hydraulic fracturing fluids to penetrate into surrounding rock units (p.53)', we are not told whether the seismic surveys undertaken to detect such features cover the entire subsurface project area. We are told only that CSG wells are located to avoid them. No mention is made of the potential to encounter unknown cross cutting features when 2500 metres are drilled horizontally in multiple directions from well surface locations.

Questions arise from the section entitled Storage and Use of Fluids (p.56). Little information is given about the fate of stored water, only that it might be reused or 'would be' disposed of to a licensed offsite facility (p.56), where it is blended with other waste water from urban Sydney and recycled for industrial processes (p.76). Nor is it stated how 'regularly' the integrity of drill pits and storage tanks will be monitored for leaks (p.56) and vague statements are made that a leak 'may not be detected for a period of time' or 'over a longer period of time' (p.57). The explanation that a significant rainfall event would result in dilution of chemical spills (p. 56-57) is designed to reassure the public, yet surely a quantity of chemical spilt remains the same quantity irrespective of dilution?

7. **Section 8.4.2: Storage and Handling of Fluids**. Here it is stated that 'The individual chemicals used in these [drilling] fluids are not stored or mixed at any of the locations in the Surface Project Area (p.75).' Is this consistent with the statement that 'In relation to workover chemicals, the volumes of the products that may be temporarily stored and used at each well pad is very small, ranging from 1L to 100L (p.77)'?

   The recommendations in Section 8.5 are vague: 'Saline water produced from the wells will be stored *either* in lined drill pits *or* water storage tanks (*majority*) [italics mine]… The water level and quality of water stored within the lined drill pits will be monitored regularly [how regularly?] to ensure sufficient space is available for rainfall contribution and to ensure that the quality of the water is acceptable for proposed future uses (p. 86)' And if the quality isn't suitable, what then?

8. **Section 9: Hazards.** 'This Project does not meet the definitions provided in regulatory guidance so is not classified as a potentially hazardous industry (p.87)'. One of the reasons given is that 'well sites are located with careful consideration of residential and other sensitive land uses (p. 87)'. We have already documented the failure of AGL's EA and subsequent documents to describe accurately the rapid urbanisation of the Surface Project Area and all the sensitive land uses located within it. 'Any future residence would be >20 m from a production well and therefore outside the hazardous zone as defined by the PHA (p.88)'. Planager's PHA notes that 'The Locational Guidelines [Development in the Vicinity of Operating Coal Seam Methane Wells, NSW Department of Infrastructure, Planning and Natural Resources, May 2004] assess the risk associated with single CSM wells located at a distance of several hundred metres away from another CSM well. As such, the interaction from one well to another can be disregarded… In 2007, AGL commissioned Planager Pty Ltd to assess the risk associated with a configuration of CSM producing wells where up to six wells are located within a single compound (PHA, p.10). Planager provides the ignition probabilities of co-located gas wells (p.40-41) but does not discuss the implications of these probabilities for those living nearby. Nor does Planager question the appropriateness of applying the NSW Locational Guidelines in which separation distances (20 metres) are determined for single wells only. The EHIA fails to take into account that the NSW Locational Guidelines are outdated and do not reflect advances in CSG technology that have allowed multiple wells to be co-located. In stating that 'Any future residence would be >20 m from a production well and therefore outside the hazardous zone as defined by the PHA (p.88)', the EHIA merely repeats the flawed conclusions in the original

PHA. In fact, Table 3.2 of the EHIA (p.27) lists four well surface locations (RA03, CU26, CU22, CU31) for which future residential homes could be as close as 50 metres. The public needs to know what health risks they would potentially be exposed to from 6 wells co-located at 50 metres distance from their homes.

9. **Section 10: Subsidence.** Section 10.4 states that 'The subterranean spacing for the wells will generally be at least 350 m (p.90)'. No further information or explanation is given. How is this spacing decided? What is the range of subterranean spacing used? The language in this section is non-specific: 'generally', 'usually', 'unlikely to have much of an effect' (p.90). This non-specific language is followed by definite assertions for which concrete evidence is not supplied: 'The conditions that could result in subsidence at the surface are, therefore, not present for this Project. It is, therefore, considered that the potential for subsidence, as a result of this project, is negligible (p.90).'

   Similar cautious language betraying a realistic degree of uncertainty followed by an unsupported assertion is found on p.53: 'On the basis of the available information there *seems a very low probability* that, *if carefully engineered and managed*, hydraulic fracturing operations would produce fractures which would penetrate and significantly affect the strata both immediately above and below the coal seams [italics mine]. Hence the possibility of fractures from these activities affecting the more shallow beneficial use aquifers in strata such as the Hawkesbury Sandstone is negligible.'

10. **Appendices:** Appendix B noise contour plot for VV03 (Fig 2-11). It is not clear how this plot was determined since no noise monitoring was done when the location of VV03 was decided after wells VV07 and VV11 were removed from consideration (SLR report, 19 October 2012, p.1). Even as it stands, Fig. 2-11 indicates that noise will be experienced at night at the Retreat Centre owned and operated by the Carmelite Friars (a sensitive location not acknowledged in the EHIA). Figs. 2-11, 1-5 and 3-11 relating to VV03 state that noise barriers will be in place to shield residences located to the south-east of the site. No information is given about the nature and location of these barriers. Further, it is clear that all three plots indicate that noise will be experienced on land owned by the Carmelite Friars and used for walks and quiet meditation by retreatants at the Retreat Centre. Since the prevailing winds are most frequently from the south (Appendix D, Preliminary Hazard Analysis, p.16) it is probable that noise received at the Retreat Centre will be greater than the noise contour plots would suggest.

    Appendix C: Yet again, the Study Area is inaccurately described: 'Most of the current and proposed operations are in an area that is largely undeveloped and is generally semi-rural in character, with agricultural lands, predominantly used for grazing, scattered between isolated areas of remnant vegetation and land designated for future (residential, commercial and industrial) development (p.7)'. No mention is made of the entire proposed Northern Expansion being located within the Sydney Metropolitan Area! If even these most fundamental facts are ignored by the assessors, how can the public be expected to have any confidence in the conclusions reached?

Figure 3 (p.14) depicts typical well construction for a vertical well, showing cement casings etc. There is no figure for typical well construction for a horizontal well. How are horizontal wells constructed? Are they cased in cement? What potential exists for connectivity between aquifers and geological strata when horizontal wells are drilled and constructed?

Table 6 (p.19) states that 'well siting requirements ensures (sic) that wells are not located within 40m of a creek'. Is this distance adequate for multiple wells co-located at a single well-surface location? The EHIA consistently fails to discuss potential risks from multiple wells that are co-located.

Section 3: Chemical Hazard Assessment. On page 28 a worked example using citric acid is given to assist in understanding the approach outlined in Table 8. No explanation is given as to why citric acid was chosen for the worked example. Perhaps it is because of the convenient conclusion offered: 'While the concentration in hydraulic fracturing water may exceed the provisional guideline, citric acid is used in many food products with no upper limit set by the WHO or FSANZ, hence the risks have been considered low… (p.28)'. Would the same conclusion be reached for substances not 'used in many food products'? Surely it would have been more honest and helpful to the public to have used hydrochloric acid or THPS (a biocide) for the worked example. Both have a moderate to high hazard ranking in Tables 8 and 9.

Appendix A (to Appendix C): Proposed Hydraulic Fracturing Chemical Summaries: we note the large level of uncertainty applied to the evaluation of Monoethanolamine Borate, and the moderate to high risks to human health and ecological impacts attributed to several of the chemicals listed. No discussion of these risks is given in the Conclusions either in relation to the Project itself, or to subsequent use of treated recycled water. Does treatment of produced water remove all hazardous chemicals?

Appendix B (to Appendix C): Material Safety Data Sheets for proposed hydraulic fracturing chemicals. We note that the biocide Tolcide is classified as toxic and dangerous for the environment and the potential for adverse effects on aquatic ecosystems has been ranked as high (despite the apparent contradiction of the ranking for fate and transport being considered low). The reason for using a biocide in hydraulic fracturing has not been given. It seems reasonable to expect a health impact assessment to provide the justification for large-scale use of a biocide in the environment, particularly as the produced water will be ultimately recycled. In the report we are told that treated produced water will be recycled for beneficial industrial uses such as brickmaking (p.76). In the past there have been reports of it being proposed for agricultural use (e.g. in Gloucester, NSW). In such a case, the potential future environmental impacts of chemicals including biocides contained in the produced water need to be considered.

Discussion of the potential for development of cross-resistance between biocides and antimicrobials might also be appropriate in a comprehensive health impact assessment.

Discussion

The EHIA is inadequate and deeply flawed. It begins by dismissing most of the concerns raised by the public because its methodology is limited to assessing known and measurable risks. All other potential risks are set aside or defined out of the scope for consideration. There has been no *critical* evaluation of specialist reports with a view to identifying their limitations and deficiencies. Many such deficiencies were identified in public submissions, which appear to have been disregarded in this latest assessment process. In fact, errors and omissions in the specialist reports have been repeated in the EHIA, and new ones have arisen (e.g. failure to appreciate the potential for 6 months of continuous construction noise (24/7) at all well surface locations). Further, the authors assume that AGL will adopt 'best practice' and is able to self-regulate. These assumptions are not well founded given the facts of incidents and breaches of licence conditions over recent years.

The methodology involves a compartmentalised approach, where each risk or effect is examined in isolation from all others. No thought is given to the possibility of cumulative or synergistic impacts. An obvious example concerns the health impact of the co-location of six wells at 50 metres from future residences. There are many other possible examples.

It is appropriate that the qualitative and quantitative risk assessments undertaken in the EHIA focus on worst case scenarios. However, an obvious worst case scenario that has not been considered is for health impact (e.g. noise, vibration, air quality) on future residences within 50 metres of well surface locations at potentially four sites.

The Report contains no Discussion section reviewing relevant literature, evaluating the data, drawing out the substance of the Conclusions and considering the suitability of the methodology and its drawbacks and limitations. No acknowledgement is made of anecdotal reports from other CSG project areas suggesting possible health impacts that need further research. No mention is made of the absence of baseline studies to enable any putative impacts of CSG extraction on human health and the environment to be scientifically evaluated in the future. Indeed, there is no evidence that AGL has considered potential health impacts of its operations in Camden since they began in 2002.

In our submission to the NSW Chief Scientist's Review of Coal Seam Gas Activities in NSW (April 2013) we drew attention to the inadequacies in the Air Quality Impact Assessment (Appendix G) of the Environmental Assessment for the Northern Expansion of the Camden Gas Project and the inconsistencies in the Response to Submissions report. For your information, I include here extracts from our submission to the Chief Scientist in relation to health impacts:

> South-western Sydney has a large population of young people, which will increase with further urbanisation as the South West Growth Centre is developed. Already it is known that NSW has a consistently high rate of childhood asthma in all regions and among the highest prevalence of asthma in the world. The reasons for this are unknown but are thought to be environmental (Peat et al, The Medical Journal of Australia, Vol. 163, 3 July 1995). In this study, 904 children from Western Sydney were included in the study sample of 6394 children aged 8-11 years studied between 1991-1993. To our knowledge, more recent data are not available. An earlier study was done at a school in Campbelltown in 1989, but we have been unable to trace those data. Have more recent studies been done? If so, what were the findings?

A study entitled State of Knowledge: Ozone, published by the Department of Environment, Climate Change and Water (2010) reported data from the Sydney region from 1994-2004. It noted that 'High ozone concentrations and exceedences of the standards occur across the whole of Sydney, and the differences between regions are generally relatively small. However, this data demonstrates that exceedences of the current one-hour and four-hour ozone standard occur more frequently in western Sydney' (pp.29, 33). Macarthur was first included in the study in 2004, so longitudinal data for this region were not available in this particular study. Recommendations are made for ambient measurements of hydrocarbons (p.112), particularly in the light of the projected increase in population of approximately 30% in western Sydney by 2026. This increase in population is spread between existing developed areas and proposed new developments (greenfield) (p.141). Have these recommendations been acted upon? Have longitudinal data for the Macarthur area been collected since 2004?

This information is sufficient to raise questions about the appropriateness of introducing the coal seam gas industry into south-western Sydney in the absence of more recent data from the area on air quality and human health.

Given the indications of potential impacts of CSG extraction on air quality and human health, we find it unacceptable that AGL considered it unnecessary to undertake baseline air quality monitoring as part of its Environmental Assessment for Stage 3 of the Camden Gas Project.

The Preliminary Hazard Analysis undertaken as part of the Environmental Assessment for Stage 3 of the Camden Gas Project 'found that the predominant sources of hazard for the Northern Expansion Project are potential CSM [coal seam methane] leaks'. These were judged (on the basis of qualitative assessment only) to be insignificant. No quantitative data were presented. We consider this unsatisfactory.

Furthermore, AGL's Responses to Submissions document contains internal inconsistencies and contradictions concerning the use of venting in its CSG activities:

'An Air Quality Impact Assessment (AQIA) was undertaken as part of the EA and was included as Appendix G to the EA. The conclusions set out in the AQIA continue to be valid and applicable to the Amended Project.' (Detailed Responses to Submissions Report, p. 43).

The Submissions Report devotes less than half a page to Air Quality and Greenhouse Gas (p.124-5). One has to mine deeply into the Detailed Responses to Submissions Report to find the following additional pieces of information:

'Air quality modelling did not predict exceedances of criteria resulting from the Northern Expansion Project… Refer to Appendix G of the EA for further information on the predicted air emissions' (Detailed Responses to Submissions Report, p.32). *But note: no modelling was done and Appendix G provides no information on predicted air emissions.*

> ‘No combustion products would be released from the well sites, with all gas being captured and transferred through the gas gathering lines to the RPGP [Rosalind Park Gas Plant]. Therefore it is not expected that the Amended Project would pose a risk to the health of the local community through its operation, as demonstrated by the coexistence of the existing CGP and local residents’ (Detailed Responses to Submissions Report, p.32).

Can AGL guarantee that no combustion products would be released from the well sites or from the wider Subsurface Project Area? As we understand it, the existing CGP does not coexist with residents *in urban areas*.

This claim that all gas would be captured and transferred to the RPGP is not supported in a response provided on the question of venting, as follows:

> ‘Venting may be a necessary but is a rare event during commissioning/production of a well, however there are several methods used to control or remove the need for venting. The Amended Project is proposing a tie-in connection to the existing CGP. In particular, wells in the southern part of the Amended Project Area *would aim to* (italics mine) immediately tie-in and send gas to the existing RPGP, which would remove the need to vent emissions at those locations… *if practical at the time of commissioning* (italics mine), wells in the central surface project area would be immediately tied-in to the gas gathering system’ (Detailed Responses to Submissions Report, p.64).

No mention is made of what AGL plans to do for wells in the northern part of the Amended Project Area.

Which gases are vented into the atmosphere? Methane? Other volatile organic compounds? Which? What monitoring/regulatory controls are there for venting and leaks at well surface locations and gas gathering lines (in addition to those for gas processing plants)? How is compliance ensured? What is known about the effects on human health of gases vented during CSG extraction and processing?

Additional health issues relate to social impacts of the CSG industry. Where landholders find themselves in conflict with industry and/or government; where they experience division and disruption of their communities and lifestyle; where they experience land values declining, affecting their ability to sell and move away i.e. where they feel disempowered, one can predict and even expect mental health consequences. These matters have been raised at various public inquiries and community forums (see for example, the Report of the NSW Upper House Inquiry into Coal Seam Gas).

It would be helpful if the EHIA acknowledged and responded to the matters raised above.

Further, a Discussion section in the EHIA could have highlighted the occasional important recommendations in the text, such as that relating to the potential for fugitive emissions to occur: ‘Saddler (2012) found that there was little information available that was relevant for Australia and the most recent methodologies used in establishing wells… It was recommended that a study be undertaken in Australia to provide data on which to base the National Guidelines’ (p.35).

(Incidentally, the reference to Saddler's review of the literature in Section 13 (References) is incomplete.) The CSIRO (Day et al. 2012) also 'recommends measurement be undertaken given that the US estimates are unlikely to be relevant for Australian conditions' (p.36).

Finally, since the release of the EHIA, an article has appeared in the Medical Journal of Australia on health uncertainties in relation to unconventional gas. The article includes several references which might inform future EHIAs (Coram, A et al. MJA 200 (4). 3 March 2014).

Conclusion

The assumptions made and the methods used have the effect of understating and under-estimating potential impacts. As a result, the image which best describes the EHIA is 'tilting at windmills'. It focuses on unlikely or marginal impacts while turning a blind eye to potentially serious impacts which are kept deliberately out of sight. Its basic weakness is that it is fundamentally a neat academic exercise focused on what can be measured regardless of its relevance to the untidy reality of life in the real world, while at the same time justifying the exclusion of inconvenient complexities on the grounds that pathways of exposure are deemed to be absent.

As such, it is clearly a 'do-able' box-ticking exercise designed to convince the public and regulatory authorities that AGL has left no stone unturned in its effort to get the Northern Expansion CSG Project up and running.

Its significant weaknesses mean that it is unlikely to allay community concerns regarding risks to human health and the environment from the proposed Project.

As a constructive way forward, we request that EnRiskS and AGL provide – for public perusal – a detailed written response to the questions and criticisms we have raised in this review of the EHIA.

Yours faithfully,

Sister Jocelyn Kramer OCD PhD
On behalf of the Carmelite Nuns, Varroville

cc. Environmental Risk Sciences (EnRiskS)
NSW Health: Environmental Health Branch