

INQUIRY INTO COAL SEAM GAS

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North Coast Environment
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NORTHERN INLAND COUNCIL for the ENVIRONMENT

Please accept this as a submission to the NSW Legislative Council Inquiry into Coal Seam Gas being conducted by General Purpose Standing Committee No 5.

This submission is provided on behalf of the following groups: the Nature Conservation Council of NSW, the Northern Inland Council for the Environment, the North Coast Environment Council and Armidale Action on Coal Seam Gas.

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SUMMARY

There is substantial evidence to indicate that coal seam gas represents a severe and growing threat to rural and metropolitan landscapes in NSW. The sheer scale of the proposed industry, with more than a quarter of the state (amounting to almost 20 million hectares of land) already covered by exploration licences, is a major cause for concern. It is apparent that this industry could expand rapidly to involve tens of thousands of wells and tens of thousands of kilometres of pipeline within a very short timeframe, as has been the case in Queensland and in America.

We have no doubt that there is no other modern industry which represents such an extraordinary threat to vast areas of rural NSW. If allowed to proceed this industry will convert large swathes of NSW into industrial zones and pose a severe risk to our water resources, our farmlands, our natural assets, our communities and our way of life.

We have not attempted to exhaustively address all the Terms of Reference relevant to this Inquiry, but instead in the submission below aim to address in detail the core issues relating to the environmental impact of coal seam gas mining and its regulation in NSW.

In summary, the key points that we would like to make are that:

1. Coal seam gas mining represents a serious threat to groundwater and surface water resources that cannot be effectively mitigated.
2. More than 1.3 million hectares of crown lands that permit mining are located within current petroleum exploration licences.
3. Coal seam gas mining on public lands will drastically undermine the use of Crown Lands for recreation, will limit the areas to which the public has access, and will have major environmental impacts on high conservation value areas including protected areas.
4. Coal seam gas mining on public lands is a form of privatisation by stealth, which

transforms the public interest in shared natural resources into a private interest held by large companies for profit to the detriment of the community.

5. Coal seam gas companies are preferentially exploiting public lands due to the inadequate constraints relating to access rules and the political support for the industry making access approvals easy to obtain.
6. Coal seam gas mining represents a serious threat to native vegetation, biodiversity and threatened species due to the severe impacts which it causes including direct clearing of bushland, fragmentation, spread of invasive species and increased fire risk.
7. The farming community is disenfranchised and threatened by coal seam gas mining, rural communities facing growing social discord, and the promised economic outcomes do not accrue to the regional communities who bear the costs.
8. Current statutes and regulations are completely inadequate to control coal seam gas exploration and mining, and substantial strong reforms are urgently needed.
9. There is inadequate public transparency in decision-making, insufficient legal rights for the community and local government is under-utilised in regulation and control of CSG.
10. Current proposed reforms by the NSW Government are inadequate to address all of these issues and impacts, and the rapid and on-going spread of the industry while the reforms are still being developed dramatically undermines their utility.

In view of these matters, we would like to see the Inquiry recommend a full moratorium on all forms of coal seam gas drilling until the environmental, social and health impacts have been rigorously and independently assessed. If this evidence indicates that it is possible to conduct some form of CSG mining safely in NSW, then that should only proceed if:

- ▲ Coal seam gas exploration and mining is made subject to all relevant environmental legislation, including the native vegetation and water management laws in their entirety.
- ▲ The community is provided full legal standing to challenge and enforce environmental

laws under which coal seam gas companies are operating.

- ⤴ Landholders are provided a right in the Petroleum (Onshore) Act to refuse consent for coal seam gas exploration or production on their land.
- ⤴ A prohibition is placed on coal seam gas exploration and mining in important bushland, valuable farmland, groundwater aquifers, residential areas and public lands.
- ⤴ All chemicals that are used in coal seam gas drilling or fracking are assessed by the chemical regulator for safety and health impacts prior to their approval for use.
- ⤴ Measures are put in place to assess and prevent cumulative impacts and to ensure that full proposals are properly considered from the outset.

THE ENVIRONMENTAL AND HEALTH IMPACT OF CSG ACTIVITIES

Effect on ground and surface water systems

There is a wide and growing body of evidence that coal seam gas extraction represents a severe threat to both groundwater and surface water resources. The findings of a number of relevant Australian studies and reviews are summarised below.

National Water Commission¹

According to the latest statement released by the the NWC, the coal seam gas industry '*risks having significant, long-term and adverse impacts on adjacent surface and groundwater systems*'. It also notes that the '*potential impacts of CSG developments, particularly the cumulative effects of multiple projects, are not well understood*'. It identifies the following risks to water management from coal seam gas:

- ⤴ Extracting large quantities of water from systems that are already over-allocated
- ⤴ Depressurisation of the coal seam altering water availability in adjacent aquifers,

¹ National Water Commission, 'The Coal Seam Gas and water challenge', August 2011.

reductions in connected surface water flows and land subsidence over large areas

- ⤴ Release of produced water altering natural flow patterns and reducing water quality
- ⤴ Use of hydraulic fracturing leading to induced connection and cross-contamination between aquifers
- ⤴ The reinjection of waste water changing beneficial use characteristics of associated aquifers

The NWC notes that *“Current projections indicate the Australian CSG industry could extract in the order of 7,500 gigalitres of co-produced water from groundwater systems over the next 25 years, equivalent to ~300 gigalitres per year. In comparison, the current total extraction from the Great Artesian Basin is approximately 540 gigalitres per year”*.

Geosciences Australia²

In their 2010 advice to the Australian Government on the potential impacts of coal seam gas extraction on the Surat and Bowen Basins in Queensland, Geosciences Australia stress that there is major uncertainty in relation to the cumulative impacts of CSG development. They state that *“we consider that the overriding issue in CSG development is the uncertainty surrounding the potential cumulative, regional scale impacts of multiple developments. The information provided in the assessed EIS documents is not fully adequate for understanding the likely impacts of widespread CSG development across the Surat and Bowen Basins; nor will any level of information or modelling that can be provided by individual proponents”*.

They go on to state that *“We consider that a regional-scale, multilayer groundwater flow model which incorporates data from both private and public sector sources is necessary to inform this understanding. We emphasise, however, that no matter how thorough a model or detailed the underlying data, any modelled outcomes will be accompanied by high inherent uncertainties*

until sufficient CSG production data is available to calibrate the groundwater model”.

Water Group Advice on EPBC Referrals³

The Water Group reviewed the QGC and Santos-Petronas coal seam gas project referrals to the Federal Environment Minister and identified significant concerns with the likely impacts on water resources. Specifically, they summarised their concerns as follows:

- “a) the general level of uncertainty associated with these proposals, and the inability of proponents to accurately quantify their individual and collective impacts over the life of their projects (which is in the order of 30 years);*
- b) the lack of surety that this represents for the Minister for Environment in making decisions;*
- c) the potential for significant impacts on MNES, particularly the listed Threatened Ecological Communities of The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin;*
- 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 coproduced water, and the uncertainty around mechanisms for their disposal, and*
 - vi. impacts on surface water hydrology from the discharge of CSG coproduced water into the Condamine and / or Dawson Rivers;*
- e) land subsidence;*

³ Water Group. 2010. Water Group Advice on EPBC Act Referrals QGC Referral 2008/4399 and Santos-Petronas Referral 2008/4059 and comments on AP LNG Referral 2009/4974.

- f) impacts on highly productive agricultural land;
- g) impacts on Indigenous cultural and spiritual values;
- h) broader impacts on Commonwealth and national policy initiatives such as the National Water Initiative, the CoAG Water Reform agenda, and the Great Artesian Basin Sustainability Initiative;
- i) broader impacts on the Murray-Darling Basin and implementation of the Water Act 2007 and the Basin Plan".

The Water Group noted that *"it can be concluded from the proponents' modelling that the legacy effects of the CSG developments are considerable, with at least 1,000 years passing before this part of the GAB will return to pre-CSG levels"*.

Moran and Vink 2010⁴

Moran and Vink (from the Centre for Water in the Minerals Industry) were engaged by the Australian Government to undertake a desktop study to determine the impacts of the proposed CSG operations in Queensland on the connectivity of groundwater systems, surface water and groundwater flows and water quality in the Murray-Darling Basin. The study was commissioned in order to comply with s255AA of the Water Act 2007.

In relation to hydrological connections between aquifers and coal seams, Moran and Vink state that *"Hydraulic connectivity between the Central Condamine Alluvium and both the Walloon Coal Measures and some GAB aquifers has been demonstrated by analysis of bore water levels and water quality data (KCB, draft in review; Hillier, 2010). Current hydraulic relationships between the alluvium and the underlying units may be altered by dewatering of the coal measures"*. They also noted the risks from subsidence, stating that *"...even small changes to*

⁴ Moran and Vink. 2010. Assessment of Impacts of the Proposed Coal Seam Gas Operations on Surface and Groundwater Systems in the Murray-Darling Basin. A report commissioned by SEWPAC.

the land surface due to subsidence may alter overland flow paths initiating new erosion features in susceptible areas. Additionally, subsidence may also change or cause fracturing in aquifers which may alter the hydraulic connectivity”.

In terms of the inadequacies of the hydraulic models that have been used to estimate CSG impacts, Moran and Vink note that *“Loss of water availability from the Central Condamine Alluvium due to direct or indirect induced leakage caused by dewatering of the coal seams could not be separately assessed due to lack of sufficiently detailed numerical model outputs and measurements from current operations”.*

They also state that *“Localised drawdown effects are likely to be significantly different to the predicted regional average drawdown owing to the spatial variability in hydraulic connectivity between the coal measures and aquifers, rates of water movement, depth of the coal seam and the thickness confining layers. No proponents have considered the effect of faulting or fractures in their models. These preferential flow features can alter local drawdown. Data on hydraulic properties is scarce. More spatially explicit hydraulic data should be collected and incorporated into models on an on-going basis”.*

Study of the Walloon Coal Measure⁵

A recent study by Hillier of groundwater resources in Queensland found that there was hydraulic connectivity between the Walloon coal measures and the alluvial groundwater, and that there was a substantial risk that de-watering of the coal measure would lead to movement of water from the alluvium to the coal measure.

Specifically, Hillier concluded that:

⁵ Hillier, John. 2010. Groundwater Connections Between the Walloon Coal Measures and the Alluvium of the Condamine River. A report for the Central Downs Irrigators Ltd.

- *"The alluvium of the Condamine River is incised into the Walloon Coal Measures*
- *The groundwater levels in the alluvium are generally falling, and have been trending downwards for the past 40 years*
- *The water levels in the alluvium are lower than those in the Walloon Coal Measures*
- *Water quality information points to a transfer of water from the Walloons to the alluvium*
- *If water can move from the Walloons to the alluvium, if the gradient is reversed, groundwater will move in the other direction*
- *There is insufficient information available on the likely dewatering level or the hydraulic conductivity of the beds between the coal seams and the alluvium for volumes of flows to be calculated.*
- *Because of the very real likelihood of movement of groundwater from the alluvium to the Coal Measures, more data is required to allow the calculation of the volumes that could be involved.*
- *A program should be instigated to obtain the data required - the permeability of the various strata that lies between the alluvium and the coal seams, water levels in the Walloon Coal measures, volumes that will be pumped etc".*

In order to obtain the data required to reliably assess the likelihood of groundwater movement from the alluvium to the coal measure, Hillier advised that there needed to be a comprehensive monitoring network established to obtain heads at various depths in the Walloon Coal Measures, and that there needed to be a detailed study to determine the horizontal and vertical permeability of various beds in the Walloon Coal Measures.

Hydro-geological Study in the Wyong Valley⁶

The application of a conceptual hydraulic model to the Central Coast water catchments, by Northern Geoscience in 2005, found that de-watering of the coal seams in the valleys would impact on the overlying groundwater resource.

Miscellaneous References

The risks to groundwater are confirmed further by various sources which indicate that there are genuine concerns as to the quality and longevity of well casings. Well failure has been identified as a major problem with 50-100 year old wells in New York State in America⁷ and studies have concluded that the integrity of gas wells cannot be guaranteed due to the failure of cement drill casings over time⁸. There is inadequate supervision and monitoring of drilling procedures during coal seam gas drilling compared to standards applied to water drilling⁹. Experts have confirmed these problems¹⁰.

The risks of cross-contamination of aquifers from artificial chemicals in fracking or drilling fluids or from naturally occurring toxins held in coal seams is also acknowledged as a risk. There have now been at least four cases of BTEX chemicals recorded in CSG wells or bores in Queensland¹¹.

⁶ Northern Geosciences. 2005. Report on Hydro-geological Investigations Dooralong and Yarramalong Valleys, Wyong Central Coast NSW. A report prepared for the Australian Gas Alliance.

⁷ Ibid.

⁸ Mavroukis 2010

⁹ Gasrush, Four Corners Program.

¹⁰ <http://news.ninensn.com.au/national/8214369/gas-wells-could-leak-chemicals-into-water>

¹¹ <http://www.smh.com.au/environment/toxins-found-at-third-site-as-fracking-fears-build-20101118-17zfv.html>,
<http://www.lngworldnews.com/australia-arrow-finds-traces-of-btex/>,

Summary

Therefore, the major issues with water that have been identified in the literature and through experience with CSG in Queensland and overseas can be summarised as follows:

1. Drawdown and/or contamination of aquifers, with impacts that may occur many decades after the drilling
2. Very long time frames for groundwater recharge
3. Subsidence leading to increased connectivity between aquifers, and cracking/draining of creeks and swamps
4. Increased pressure on over-allocated systems
5. Cumulative impacts that are poorly understood
6. Groundwater modelling techniques that are inadequate
7. Impacts on surface water hydrology and water quality from discharge of produced water
8. Chemical pollutants affecting water sources in various stages of the process
9. Problems with disposal of brine and other wastes

In NSW, CSG extraction is likely to pose a major threat from all the problems outlined above. In the Pilliga, coal seam gas drilling risks depressurising important recharge aquifers of the Great Artesian Basin.

Already, during the exploration phase, spillage of saline water has led to extensive tree deaths (for example at Bohena 2 and Bohena 7 wells), disposal of water in unlined drill ponds has led to salt scalds and animal deaths, and disposal of treated water has altered the hydrology of a local creek system from an ephemeral system to a permanently saturated system for at least 500m (Bohena Ck). Drill ponds have been recorded overflowing during flood events (Dewhurst 8 complex) and there has been a recorded event of chemical spillage (Culgoora 2).

Presently, in the Pilliga, produced water that is treated with reverse osmosis is discharged into the Bohena Ck. Such water is still at risk of containing elevated salt levels compared to the creek water and may also still contain other contaminants that are not removed by reverse osmosis. Bohena Ck is an ephemeral creek with a shallow alluvial aquifer that discharges into the Namoi River, part of the Murray-Darling Basin. Eastern Star Gas claim that up to 1ML per day is currently discharged into the creek, although flow rates at the discharge point suggest a far greater volume is likely to be discharging. There is no requirement for comprehensive monitoring to be conducted of the quality of the water that is discharged nor of the impacts of the discharge on the ecological character of the creek. The only requirement contained in the Review of Environmental Factors is that ESG conduct 'visual' inspections of the creek. However, it is apparent that such discharge has the potential both to substantially reduce water quality and to dramatically alter the ecological nature of the creek from ephemeral to permanently saturated.

If Eastern Star Gas were to go to full production and place 1,100 well-heads in the Pilliga forest, there would be vastly increased volumes of water that are likely to be discharged into local creek systems, with major risks to the creek systems of the Murray-Darling Basin. Using the upper estimate of water production provided by ESG of 0.16ML per well per day, and applying it to the proposed 1,100 wells, results in an upper estimate of 176ML of water produced each day amounting to a total of 64GL per year. This is a vast quantity of water which will dramatically alter the ecology of the Bohena Ck system if it were discharged - it would change an ephemeral creek system into a permanent watercourse and dramatically alter the ecology of the area.

At Casino, coal seam gas drilling and saline water storage on the floodplain represents a threat to surface water health. In the Illawarra escarpment and the Tomago sandbeds, coal seam gas drilling represents a severe risk to drinking water supplies. In the Illawarra, the impacts of subsidence may lead to serious damage to surface water creek systems and heavy rainfall events

are likely to lead to erosion around roads and infrastructure and declining water quality. The Sydney Catchment Authority has strict controls on entry into catchment areas, prohibiting any access for recreational or other such purposes. It is extraordinary that people are excluded from walking in such sensitive areas but that coal seam gas companies are allowed in to sink wells and construct all associated infrastructure. In the Liverpool Plains near Gunnedah, coal seam gas drilling threatens shallow alluvial aquifers that are crucial to food production.

It is apparent that the hydrological impact assessment and modelling that is currently conducted prior to CSG extraction is inadequate to properly assess the risks at an appropriate scale. We have been advised that there are new groundwater assessment techniques, that are being utilised in the United States, that involve electro-kinetic methods that can provide far more reliable maps of aquifers and the connectivity between them. We believe that there should be a mandatory requirement for the application of the newest and best available technologies to assess and model the likely impacts of coal seam gas extraction. The work should be conducted independent of the companies - as experience shows that consultants working for the proponents are inherently captured and cannot provide independent studies.

Disposal of waste

There are major issues pertaining to disposal of waste in CSG activity, and there is a lot of uncertainty with regard to how waste is currently being disposed of from CSG exploration activities. There are three major types of waste produced, for example, by Eastern Star Gas in the Pilliga: cuttings produced during drilling, sludge produced from drilling and concentrated brine derived from treatment of produced water.

At the moment, there is no clear reporting as to how these wastes are being dealt with, or certainly none that we have been able to find in any official documents. At present it seems that cuttings are buried in the drill ponds when they are filled, with unknown environmental

consequences. There is no information on how or where the highly toxic drilling sludge is disposed of, and there is equally no information on how the concentrated brine held in a storage pond is being dealt with or will be dealt with in the future. Given the volume and toxicity of these waste products, it is extraordinary that there is not a strong regulatory system in place to control their management. In the Pilliga, for example, if the full proposal for the Narrabri Coal Seam Gas Project goes ahead, we estimate that it will produce up to 52ML of concentrated brine per day, which would equate to 18GL each year that would have to be disposed of. This is based on 30% of treated water remaining as concentrate after reverse osmosis, which is given as the likely recovery rate by ESG (2006), when they state that *"Preliminary modeling of the treatment process suggests that the rate of recovery will approximate 70%; that is 70% of the production water passed through the treatment unit will be recovered as permeate for reuse and discharge and the remaining 30% as concentrate for storage and further evaporation"*.

The fact of the matter is that there is no long-term solution to the waste that is produced from CSG mining. That is evident in the Northern Rivers, with Metgasco recently applying to the Richmond Valley Council to build a second temporary holding pond to store wastes, with no long-term plan for its disposal.

Another approach that has been proposed and is apparently being trialled in Queensland CSG projects¹² and utilised in the US¹³ is re-injection of produced water or brine back into aquifers. Re-injection is energy intensive and expensive¹⁴ and it poses a risk of contaminating other aquifers with saline water or brine¹⁵.

¹² Australia Pacific LNG Project Talinga/Orana Environmental Management Plan

http://www.aplng.com.au/pdf/talinga/Talinga_Att_5_Talinga_aquifer_injection_trial_management_plan.pdf

¹³ Farag et al 2010, "Potential effects of coal bed natural gas development on fish and aquatic resources" p.7 from <http://www.uwyo.edu/wycoopunitsupport/docs/Potential%20Effects%20of%20Calbed%20Natural%20Gas.pdf>

¹⁴ Warrence and Bauder, 2008

¹⁵ Australian Government National Water Commission, 'The Coal Seam Gas and water challenge', August 2011.

Effects on Crown Lands including Travelling Stock Routes

The coal seam gas industry poses a major threat to Crown Lands in NSW. An analysis of current exploration and production licences indicates that petroleum titles in NSW currently cover an area of 1.3 million hectares of State Forests, State Conservation Areas and Travelling Stock Routes. All of these titles are available for exploration and coal seam gas production.

Map 1 shows the distribution of mapped public lands in NSW which overlap with current petroleum titles. Additional areas of Vacant Crown Lands and Crown Reserves which are not currently readily available in mapped form are also at risk.

Table 1 below provides a summary of the areas of each public land tenure listed above within existing petroleum titles in NSW. In total, some 39% of these tenures are located within existing petroleum titles in NSW.

Table 1. Public lands available for mining within petroleum titles in NSW

| Category | Area in Petroleum Titles (hectares) | Total Area in NSW (hectares) | Percentage at risk |
|----------------------------|--|---------------------------------|--------------------|
| Travelling Stock Route | 215797 | 482288 | 45.00% |
| State Conservation Area | 373207 | 713871 | 52.00% |
| State Forests | 747453 | 2212396 | 34.00% |
| Total | 1336457 | 3408555 | 39.00% |

It is apparent that the ease with which miners can obtain access to public lands means that they are increasingly targeting such lands as the first step in exploration. In north-western NSW, Eastern Star Gas has sought to establish its first exploration and production area in the State

Forests of the Pilliga and further north several coal seam gas companies have sought to drill preferentially on Travelling Stock Routes in the early phases of exploration. In the Illawarra, coal seam gas companies are drilling in public catchment areas. Coal seam gas mining will have a direct negative impact on both conservation and recreation on public lands.

State Conservation Areas are protected areas that are gazetted under the National Parks and Wildlife Act 1974, that form part of the National Reserve System and that are categorised as Reserve Category II by the International Union for the Conservation of Nature. The primary objective of IUCN II reserves is to *protect natural biodiversity along with its underlying ecological structure and supporting environmental processes, and to promote education and recreation*¹⁶. It is clear that the extensive surface disturbance caused by coal seam gas mining is completely incompatible with the objectives of IUCN conservation areas. The risks to State Conservation Areas from CSG are severe, with more than 52% of all SCAs in NSW already covered by petroleum exploration licences.

Travelling Stock Routes are well-recognised as some of the most valuable vegetation remnants left west of the Great Dividing Range. They are ribbons of green in a heavily cleared landscape and often contain the only intact native vegetation remaining in a landscape. They have outstanding natural and cultural heritage values, and are closely associated with the droving lifestyle that has been immortalised by a number of great Australian poets. They are still used for grazing and they often contain important watering points. Coal seam gas extraction is incompatible with both their current uses and with their natural and cultural values. CSG will alienate TSRs from use by stock, severely damage these sensitive environments and prevent many of the recreational uses that are currently allowed.

In a letter to the NSW Minister for Primary Industries, dated 2nd June 2011, the Chairman of the State Management Council of the Livestock Health and Pest Authority specified that LHPA

¹⁶ http://www.iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/pa_categoryii/

concerns with CSG mining refer to:

- ⤴ *"Possible impacts on TSRs which are prime examples of natural ecosystems*
- ⤴ *Possible impacts on underground water including the Great Artesian Basin and the*
- ⤴ *threat this poses to water quality used by stock accessing TSRs*
- ⤴ *Its core function is to safeguard agriculture in NSW*
- ⤴ *TSRs will be targeted in areas where landholders oppose the development*
- ⤴ *The activity occurring on TSRs where landholders oppose the development impacts on the LHPAs image of being there to assist landholders"*

The LHPA went on to request that the Minister consider the following recommendation:

1. *"That the State Government supports an indefinite moratorium on all CSG new mineral and extraction activity until satisfied through the provision of independent expert evidence that:*
 - ⤴ *There will be no significant or irreversible impacts on the level and quality of aquifers, natural waterways, and the Great Artesian Basin.*
 - ⤴ *There will be no detriment to or loss of neighbouring prime agricultural land, and*
 - ⤴ *There is evidence that CSG does not pose a risk to human or animal health*
2. *That the environmental and agricultural benefit of the TSR will have priority over CSG exploration and extraction activity.*
3. *The LHPA be included in any negotiation relating to access to TSRs for CSG or extraction activity".*

These sensible recommendations by the LHPA State Management Council to the NSW Government seem to have been ignored. Unfortunately, the NSW Governments pre-election 'Strategic

Regional Land Use Policy' actually proposes to target crown lands for mining infrastructure. It states that *"An elected NSW Liberals and Nationals government will.....review existing arrangements for land access for mining and petroleum industries to ensure they achieve our goal of facilitating good relations and timely access. This will include promoting the use of crown land, such as Travelling Stock Routes, for pipeline routes where viable and the establishment of energy and transport corridors..."*

Such an approach is inconsistent with the outstanding values of TSRs and other Crown Lands and with the stated intentions of the LHPA. This is already a cause of concern, with the Eastern Star Gas pipeline from the Pilliga to the proposed LNG export facility at Newcastle passing through high conservation value Travelling Stock Routes.

State Forests are public lands that are managed under the Forestry Act 1916. Section 8A of the Act sets out the objects of the Forestry Commission in its management of State Forests as follows:

(1) The objects of the commission shall be:

(a) to conserve and utilise the timber on Crown-timber lands and land owned by the commission or otherwise under its control or management to the best advantage of the State,

(b) to provide adequate supplies of timber from Crown-timber lands and land owned by the commission or otherwise under its control or management for building, commercial, industrial, agricultural, mining and domestic purposes,

(c) to preserve and improve, in accordance with good forestry practice, the soil resources and water catchment capabilities of Crown-timber lands and land owned

by the commission or otherwise under its control or management,

(d) to encourage the use of timber derived from trees grown in the State,

(e) consistent with the use of State forests for the purposes of forestry and of flora reserves for the preservation of the native flora thereon:

(i) to promote and encourage their use as a recreation, and

(ii) to conserve birds and animals thereon, and

(f) to provide natural resource environmental services (whether within or outside of New South Wales).

Coal seam gas mining is directly incompatible with the objects of the Forestry Act 1916:

- ▲ It will have a detrimental impact on timber resources, through permanent clearing of significant areas of forests - for example, in the Pilliga, Eastern Star Gas plan to clear 2,400ha of vegetation for their proposed gas field.
- ▲ It will not preserve and improve the soil resources and water catchment capabilities of Crown Lands, but will instead represent a threat to both
- ▲ It will undermine and prevent the use of State Forests for recreation, as large areas of forest will be fenced off and the public will be excluded, as has already occurred in the Pilliga during exploration. Recreation options are dramatically reduced as a result of the change from a forested area to an industrial zone.
- ▲ It will threaten birds and animals and cause severe damage to their habitats, and will undermine natural resource environmental services such as clean water supply and carbon storage.

Even though coal seam gas mining is not allowed in National Parks, they are not immune from its impacts. At Putty, there are plans to explore just 500m from the World Heritage-listed Wollemi National Park, and at Pogy drilling is occurring on an inholding within Goulburn River National Park. At Mt Kaputar, exploratory wells have been located around the edge of the National Park, effectively ringing it. In the Northern Rivers, a major gas pipeline is proposed to be constructed along a road that passes through the World Heritage-listed Border Ranges National Park. There should be a major buffer around National Parks that prevents exploration anywhere in their vicinity to prevent negative impacts, and pipelines should not be allowed to pass through National Parks.

Summary

Coal seam gas mining on public lands is inappropriate and likely to have very severe environmental impacts. It seeks to transfer the public interest and turn it into private gain for a small number of largely multi-national companies. It will drastically undermine the use of Crown Lands for recreation, will limit the areas to which the public has access, and will have major environmental impacts on high conservation value areas.

Effects on the natural environment and biodiversity

There will be serious impacts on native vegetation and biodiversity from coal seam gas mining in NSW. This is an aspect that is often over-looked during discussion of its impacts.

Impacts on aquifers represent a major threat to wetlands, including Ramsar-listed wetlands, and to groundwater dependent ecosystems. Notably, a recent study for the Namoi Catchment Management Authority has identified most of the woodland vegetation in the Pilliga as having high potential as being a groundwater dependent ecosystem. Therefore, any impacts on

groundwater is likely to have substantial repercussions for those woodlands, and for the species which utilise them as habitat.

In the Maules Creek area, there are unique groundwater invertebrates, known as stygofauna, which are highly sensitive to any changes in groundwater. They are thought to play a role in filtering and cleaning groundwater. These fauna are very poorly researched and therefore their full distribution at this stage is unknown, but they are also likely to occur in other aquifers that have not previously experienced major changes in groundwater levels or chemistry. Macquarie Energy currently has an exploration licence over the Maules Creek area. It has to date, as part of that licence, drilled a string of wells right around the edge of Mt Kaputar National Park.

Groundwater impacts from coal seam gas mining has the potential to affect wetlands that are far removed from where the mining occurs. For example, approved coal seam gas projects in Queensland already represent a risk to wetlands in NSW, such as the Narran Lakes.

The impacts of coal seam gas extraction on native vegetation in the Pilliga are likely to be severe. The Pilliga is the largest temperate woodland left in eastern Australia, and one of our most important natural assets. It is 'a million wild acres', some 500,000 hectares in size, and it has recognised national and international conservation significance. It is located in a national biodiversity hotspot, the Brigalow Belt South, it is an internationally listed Important Bird Area, and it provides habitat for up to 30 listed matters of national environment significance and up to 48 threatened species and communities under NSW legislation.

The Pilliga is the largest remnant left in the Wheat-Sheep Belt of NSW. It is surrounded by largely cleared agricultural land. It is now a last stronghold for many species, including numerous bird species, that are now declining throughout their range. Of particular conservation significance is the fact that the Pilliga provides core habitat for:

- ▲ The only known population of the endemic and nationally vulnerable Pilliga Mouse
- ▲ The largest Koala population in inland NSW
- ▲ The only known Black-striped Wallaby population in inland NSW
- ▲ The recognised population stronghold for the nationally-vulnerable South-eastern Long-eared Bat
- ▲ The recognised population stronghold for the Barking Owl in NSW.

Experience in the Pilliga indicates that coal seam gas exploration and production leads to major clearing and fragmentation of native vegetation. Even during the exploration phase, the following impacts have occurred: clearing of up to 150 hectares of native vegetation, heavy fragmentation of 1,700ha of native vegetation, an increased footprint across 44,000ha of native vegetation. This has included clearing of habitat for NSW and nationally-listed species.

If the full production project that is proposed by Eastern Star Gas is approved, it would allow the clearing of at least 2,400 hectares of native vegetation and the fragmentation of an area of 85,000 hectares. Well-pads would be cleared to a size of 1.2 hectares, some 1,000km of pipelines would be cleared, and there would be additional clearing for roads, tracks and infrastructure. Well-pads would be placed on a 500m grid, effectively carving up the most intact patch of bush in western NSW into a highly fragmented industrial zone.

Numerous scientific studies have reviewed the impacts of fragmentation of bushland on native fauna. Fragmentation is likely to have a detrimental effect on fauna species that survive initial clearing. Fragmentation often leads to small, isolated populations that are prone to extinction. These small populations may be subject to loss of genetic variability and inbreeding depression, fixation of deleterious mutations, and are more likely to become extinct through stochastic environmental events such as fire.

Fragmentation may reduce food availability, increase predator abundance, and restrict normal adaptive behaviour¹⁷. Of particular concern is the impact of fragmentation on cooperative breeders (species where offspring of at least one sex remain on the natal territory to raise subsequent generations; an unusually high proportion of Australian species breed in this way) and other territorial species. Many Australian species maintain territories between years and generations and cannot relocate once that habitat is lost. Among Australian birds, for example, fragmentation has been shown to disturb the dispersal of cooperative breeders, contributing to the decline of some passerines that inhabit fragmented woodland¹⁸.

The negative impacts of fragmentation, as described above, are a particular cause of concern in the Pilliga, because it is the size, integrity and connectivity of the Pilliga that gives it such ecological significance and why its preservation helps meet conservation objectives (e.g. *Pilliga Nature Reserve Plan of Management, NPWS 2003*).

There is already evidence from the exploration phase that coal seam gas extraction leads directly to increased weed invasion, which will degrade the entire ecological value of the Pilliga. Similarly, roads and tracks on a grid pattern are known to lead to the ingress of feral animals. The impacts of coal seam gas on native vegetation and biodiversity in the Pilliga will be severe, and similar impacts will occur in other parts of the state where coal seam gas extraction occurs in bushland areas. At particular risk are large areas of public land in the Clarence Moreton Basin in the northern rivers region.

Fire Risk

Coal seam gas extraction represents a substantial fire risk, especially in wooded landscapes,

¹⁷ For a description of some of the impacts of fragmentation, see <http://www.sciencedirect.com/science/article/pii/S0006320700001014>

¹⁸ For details on a study of the impacts of fragmentation on the Brown Treecreeper, see <http://www.biol.vt.edu/faculty/walters/Publications/Cooper%20and%20Walters%202002a.pdf>

from increased ignition sources, the extraction of a highly flammable fuel (methane) from deep underground to the surface, and the potential for underground fires in dewatered coal beds. American reports point to a high incidence of fires and explosions associated with wells¹⁹, and also to fires associated with pipelines. These risks will be dramatically intensified in the Pilliga forest, because it is already prone to fast-moving high intensity burns. The introduction of a gas field into such an environment is irresponsible, and may well result in a catastrophic fire event.

Most fires in the Pilliga at present are caused by dry lightning strikes, and there are also issues about lightning interacting with coal seam gas infrastructure, including metal well heads. In America, there are serious concerns also about the potential for 'spontaneous combustion and continued burning of completely dewatered coal beds', which have been raised by the US Energy Justice Network²⁰. They state that *"When water is pumped out of coal seams, coal becomes exposed to oxygen, and coal fires are possible"*. The scale of this risk in NSW is unknown.

An increase in fire risk in the Pilliga is likely to lead to an increase in both frequency and intensity of fires. Given that the Pilliga area is already known for extremely hot burns that travel vast distances in short time frames, any increase in risk must be considered a potentially serious threat to both human safety and to native wildlife and biodiversity in the area. We believe the location of a gigantic gas field in such a fire prone environment may lead to catastrophic fire events, and consider the proposal both irresponsible and inappropriate for the location.

Volunteer firefighters should not be asked to risk their lives in the Pilliga to fight fires caused by placing a gigantic gas field in the middle of a tinder box.

Nature and effectiveness of remediation required under the Act

We do not believe that rehabilitation requirements are adequate or that there are any

¹⁹ Fractured communities

²⁰ From <http://www.energyjustice.net/naturalgas/cbm#173>

meaningful methods to hold coal seam gas companies to account with regard to rehabilitation. Experience in the Pilliga has shown that well-pads become dominated by weeds and are not rehabilitated. Saline water spillages that have led to extensive tree deaths, albeit under a prior operator to Eastern Star Gas, have just been left as they are with no rehabilitation.

There has been little or no successful rehabilitation of abandoned drill holes in the Pilliga and there are numerous serious weed incursions at almost every corehole that has been drilled. Examples include Dewhurst 6c, Dewhurst 5, Bohena 2D, Bohena 7 and numerous other well-pads. The failure with regard to rehabilitation is despite the fact that the relevant REFs require 'the removal of imported materials and the rehabilitation of the site'. There has been no rehabilitation of areas which have been subject to tree deaths at Bohena 2D, 3, 4/4L, 5 & 7 and Dewhurst 5.

Effect on greenhouse gas and other emissions

Recent research from America²¹ has indicated that fugitive methane emissions from shale oil gas which is very similar to coal seam gas extraction, when fully accounted for, render it much the same as coal with regard to life-cycle greenhouse gas emissions. There is currently no truth in accounting with regard to these emissions nor has there been sufficient research conducted in Australia. A rigorous set of criteria and detailed research project is urgently require to properly quantify the extent of fugitive emissions from coal seam gas in NSW, before the industry is to proceed any further here.

Howarth²², in his study of emissions from largely shale gas operations in America, concludes that *"Methane contributes substantially to the greenhouse gas footprint of shale gas on shorter time scales, dominating it on a 20-year time horizon. The footprint for shale gas is greater than*

²¹ Howarth, Santoro and Ingraffea. 2011. Methane and the greenhouse-gas footprint of natural gas from shale formations. Climatic Change. <http://graphics8.nytimes.com/images/blogs/greeninc/Howarth2011.pdf>

²² Howarth, Santoro and Ingraffea. 2011. Methane and the greenhouse-gas footprint of natural gas from shale formations. Climatic Change. <http://graphics8.nytimes.com/images/blogs/greeninc/Howarth2011.pdf>

that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years. Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years".

This increase in emissions results from the fact that methane is released during the processes of drilling and fracking, and over the life of the well through venting and leaks. In the Pilliga, recent evidence has revealed leaking gas pipes and a water drain bubbling methane gas to the atmosphere. Venting of methane into the atmosphere has been observed at a number of wells in the Pilliga, as has flaring of gas. Fugitive emissions from methane are particularly problematic with regards to global warming because when considered over a 20-year period the climate change force of methane is 72-times greater than carbon dioxide.²³

There are also numerous other sources of greenhouse gases associated with coal seam gas production. The full life-cycle emissions need to be properly assessed, and should include transport and machinery operation, reverse osmosis, extraction, pipeline transport, leakage, liquefaction, shipping, regasification and generation. Many of these stages, including liquefaction and reverse osmosis in particular, are very carbon intensive. This is particularly relevant as most coal seam gas in Australia seems destined for export, with the added carbon cost of liquefaction.

The fact is that coal seam gas is a fossil fuel with major greenhouse gas implications - that will produce 40 times the amount of greenhouse gases generated by genuinely renewable power sources such as solar and wind technologies. The coal seam gas industry in Australia and NSW is largely being developed for an export market, it is not being developed as a transition fuel for our country. The Eastern Star Gas proposal in the Pilliga is planning to export the gas from a proposed LNG export facility at Kooragang Island at Newcastle. The development of this industry in NSW is not about domestic gas production, and that is a very important distinction

²³ Fugitive emissions: what is the real footprint of coal seam gas?

<http://theconversation.edu.au/fugitive-emissions-what-is-the-real-footprint-of-coal-seam-gas-2940>

that needs to be made when considering its future. By bolting headlong into an export gas rush we will undermine the development of real renewable energy and create massive environmental problems that will last far longer than the short-term profits to a few lucky CSG companies. We should move directly to renewable energy, and not proceed with another fossil fuel with severe environmental and social impacts.

THE ECONOMIC AND SOCIAL IMPLICATIONS OF CSG ACTIVITIES

The coal seam gas industry has experienced rapid expansion in recent years. That industry expansion has come at the cost of not only environmental values, but the respect for socio-economic impacts. Citizens on the periphery - and often at the heart - of coal seam gas exploration areas are at great risk of losing control of their own property when they are denied their basic rights as land owners. CSG drilling companies are issued exploration and drilling permits against the express wishes of landholders, who have little recourse or legal options to defend their rights. A rural property that has been stripped of its natural vegetation and developed into a field of drilling rigs has lost its value to the owner. Unfortunately it has also lost much of its resale value; moving away is not an option for affected residents.

Australia's domestic food supply is of critical importance, not only to the population dependent upon it but to the farmers who produce it. Food security is threatened by CSG mining practises which do not take into account the value of the land, only the value of what lies beneath it. Grazing land is rendered unusable when it becomes a gridwork of pipelines, supply roads and wellheads. Again, this land loses resale value, leaving farmers with no means to escape the situation CSG mining companies have forced upon them.

Communities are also put at risk from the common practise of hiring outside labour to work drilling fields. Workers brought in from elsewhere have little attachment to the community or the land and do not contribute to the local economy on a long-term basis. The influx of outsiders

often drives up rent, food and fuel prices. Locals do not see an increase in employment to offset these higher costs of living. Evidence also shows an increase in crime rates and violence in these areas.

Considering the consequences for these communities, it is particularly unconscionable that they are largely excluded from the planning processes of CSG mining companies. Even local governments are left in the dark, often not aware of plans to explore for CSG until the land is already being cleared. Current legislation and legal recourse is totally inadequate, the public voice is nearly nonexistent, and CSG mining companies would prefer it remain that way.

History has taught us countless harsh lessons about what happens when companies who stand to make a great deal of money from natural resources are allowed to operate unchecked.

THE INTERACTION OF THE ACT WITH OTHER LEGISLATION AND REGULATIONS

The current legal framework

There are major problems with the legal framework within which coal seam gas exploration and mining is regulated. It is beset by inadequate legal constraints, exemptions from key environmental statutes and provisions, lack of public transparency, exclusion of local authorities from decision-making powers, and poorly considered interactions between various statutes and planning policies.

The problems with the Petroleum (Onshore) Act 1991 and associated regulations, including the Petroleum (Onshore) Regulation 2007 and the SEPP (Mining, Petroleum Production and Extractive Industries) are manifold. Firstly, the PA provides gas companies with the power to serve notice on landholders which requires them to negotiate an access agreement and which forces them to attend arbitration or face the Land and Environment Court if an agreement cannot be reached.

The Act should be amended to provide landholders with the right to directly refuse access to coal seam gas companies who want to explore for or produce gas on their lands.

The controls on exploration in the PA and associated statutes are very weak. Experience in the Pilliga shows that commercial production of gas is allowed under an exploration licence and assessment lease. The SEPP makes exploration an activity that is permissible without development consent under the NSW Environmental Planning and Assessment Act 1979, apparently regardless of whether that exploration is being used to fuel gas production. This represents a major loophole in the laws. It allows companies to conduct excessive work which equates to production under the guise of exploration, however the constraints imposed on it and the approvals required are far less rigorous. This is particularly evident in the Pilliga, where in the so-called exploratory phase Eastern Star Gas has undertaken:

- ▲ The drilling and on-going management of more than 92 coal seam gas bores and coreholes
- ▲ The conduct of 482km of seismic surveys
- ▲ The construction and management of 56.6km of gas and water gathering pipelines
- ▲ The development and management of five pilot production gas fields, encompassing 35 pilot production bores
- ▲ The construction and management of a gas-fired power station at Wilga Park, including an upgrade of the station from 10MW to 40MW
- ▲ The construction and operation of 1 reverse osmosis unit
- ▲ The construction and management of 13 major water treatment dams/impoundments and numerous drill ponds
- ▲ The discharge of at least 1ML per day of treated produced water into the Bohena Ck, part of the Murray-Darling Basin.
- ▲ The bull-dozing of numerous roads and tracks to facilitate the construction and operation of works listed above.

All of these works have been undertaken without obtaining a production licence, but have been accommodated within exploration and assessment leases. The concept of 'pilot production' that is widely used by coal seam gas companies during exploration, has no standing at law and appears to be a loophole that is used to conduct production under the guise of exploration.

The other major problem with the PA is the weak provisions surrounding the granting of petroleum titles. There is no requirement for any meaningful environmental considerations prior to the granting of a title and there is no public exhibition or consultation requirements. Similarly, title renewals are equally problematic with no clear objective tests which the Minister must apply and no public consultation requirements. There should be a rigorous process introduced to apply before titles are granted with full public transparency. To provide an idea of the scale of the problem, at present in NSW there are 5.5 million hectares of petroleum exploration titles that have expired. No-one knows anything about the status of these titles or how they are being assessed for renewal by the NSW Government. In the mean time, exploration work is allowed to continue unhindered in these areas despite the fact that the title has effectively expired. There appears to be no limit to how long such a situation may continue, with some expired titles now at least 7 months old. Map 2 shows the distribution of expired petroleum titles in NSW at the time of writing.

During exploration there are no requirements for public exhibition of either licences or of any other approvals prior to works being undertaken. The only substantive approvals that are required at the exploration stage are Reviews of Environmental Factors under s111 of the NSW EP&A Act 1979. These are not made available to the public until after they have been approved and often a lengthy time after the activities have actually been undertaken. There are no legal avenues for the community to challenge these consents.

In addition, in NSW coal seam gas exploration is exempt from numerous key environmental statutes that are placed on agricultural industries, including the Native Vegetation Act 2003 and sections of the Water Management Act 2000.

Petroleum exploration is exempt from the requirement to obtain a water access licence under the Water Management Act 2000, if the volume obtained is up to a maximum of 3ML per year. This has improved due to recent amendments that imposed the 3ML maximum, however those amendments also allowed existing exploration activities to continue without an access licence. This means that Eastern Star Gas operations in the Pilliga, which are extracting large volumes of groundwater, still do not have a water access licence. The exemption is contained in section 18 (1) of the Water Management (General) Regulation 2011. Coal seam gas exploration is also exempt from s 91B (1) of the Water Management Act 2000 which requires approval to be sought for a water supply work, and they are exempt from the requirement to advertise the application for an approval under Part 3 of Chapter 3 of the Act. These exemptions are also contained in the Water Management (General) Regulation 2011.

Section 25 of the Native Vegetation Act 2003 specifies that *"This Act does not apply to the following types of clearing of native vegetation:(m) any clearing authorised under the Petroleum (Onshore) Act 1991"*. Furthermore, this exemption also covers clearing for petroleum production, so that even full-scale coal seam gas developments are not subject to the NV Act. In addition, the Native Vegetation Act 2003 does not apply to Crown Lands or State Forests, which were excluded because they were not considered to be threatened by any form of broadscale landclearing. However, with the expansion of coal seam gas mining on to public lands, that is clearly no longer the case. Therefore, all of the vegetation that has been cleared for CSG exploration to date in the Pilliga has been cleared without an approval under the Native Vegetation Act 2003.

Part 3A of the NSW EP&A Act 1979, and its replacement in the form of transitional planning provisions applying to state significant development, is flawed and inadequate to protect the environment or the community from negative impacts of coal seam gas development. State significant development is effectively exempt from a number of pieces of important legislation and requires that other approvals must be granted once a planning approval is given.

Particularly concerning is the fact that the transitional provisions require the provision of an environment protection licence under the Protection of the Environment Operations Act once planning approval is granted for state significant development. This is likely to have major implications relating to the discharge of produced water into creek systems in NSW. When approvals are granted for state significant development by a Planning Assessment Commission the community loses legal rights to appeal those decisions in a court of law. The public deserves full third party legal standing to challenge coal seam gas developments, at both the exploration and production stage, in NSW. Substantial reform is required to the NSW EP&A Act 1979, along the lines recommended by the NSW Environmental Defenders Office, to provide a far more rigorous approval process for large scale infrastructure such as mines.

There are major issues with compliance and enforcement of environmental regulations when it comes to coal seam gas exploration and mining. It is apparent that the vast scale of the footprint of CSG makes it almost impossible for regulators to keep up. In fact, experience in the Pilliga is that regulators have virtually no understanding of what is happening and that they have neither the resources nor the will to hold coal seam gas companies to account. The types of concerns with regard to compliance that have arisen in the Pilliga include:

- ▲ Failure to line drill ponds - at wells such as Bohena 7, Bibblewindi 16, Bibblewindi 22
- ▲ Water leakage and salt scalds around wells - at wells such as Dewhurst 2, Bibblewindi 16 and Bibblewindi 21H
- ▲ Spillage/leakage of saline water leading to tree deaths - at wells such as Bohena 2, 3, 4,

5 & 7, Dewhurst 5 and adjacent to the water treatment facility.

- ⚠ Water pipes from highly saline ponds leading directly to vegetation and creek systems - Bohena evaporation ponds
- ⚠ Waste water released directly into a creek system - Mollee Ck
- ⚠ Overflow of drill ponds into surrounding vegetation during a rainfall event - Dewhurst 8 complex
- ⚠ Spillage of chemicals during a flood event - Culgoora 2
- ⚠ Gas leakage from a pipe at Bohena 3 and a from a water drain at Bibblewindi
- ⚠ Reported animal deaths near drill ponds and reported fencing failures and inadequacies at numerous wells
- ⚠ Concerns about excessive clearing reported at Dewhurst 8 complex, Wilga Park water treatment works and for access roads.

The current 66 exploratory and pilot production wells in the Pilliga are spread out across a large area. In fact, the external footprint of all seismic work and exploratory wells within the Pilliga is at least 44,000 hectares. The compliance issues identified above simply would not be identified by a government agency checking a couple of wells once a year, or less. Proper monitoring requires regular and detailed investigations of CSG operations, which requires vast resources given the scale of the impact.

After much community concern and state-wide media attention, we understand that the NSW Government has recently finally conducted some form of compliance audit of Eastern Star Gas operations in the Pilliga forest. The full results of that audit should be made publicly available as soon as possible. However, ad hoc audits triggered by extensive community opposition is not an appropriate way to regulate such a damaging industry. If the Government cannot allocate the full resources required to implement a rigorous and regular compliance and monitoring regime, then the CSG industry should not be allowed to proceed.

Another major compliance issue has arisen in relation to the application of the Federal Environment Protection and Biodiversity Conservation Act 1999 to exploration activities. A detailed review and analysis conducted by a number of environment groups has revealed that Eastern Star Gas has conducted all of its exploration activities in the Pilliga to date without ever referring the matter to the Federal Government for an approval under the EPBC Act 1999²⁴. This is despite the fact that the activities have cleared significant areas of native vegetation in habitat for nationally threatened species. The cumulative impact of the clearing of each different exploration activity does not seem to have ever been taken into account. The Federal Government is currently conducting an investigation into the activities, releasing a statement in response to the report by environment groups which said that²⁵ *“Eastern Star Gas is co-operating with the Department of Sustainability, Environment, Water, Population and the Community in an investigation of potential non-compliance with the Environment Protection and Biodiversity Conservation Act in relation to existing coal seam gas infrastructure”*.

Another major legal problem is the fact that coal seam gas companies look set to follow the lead of coal companies, by gaining initial approvals to commence operations and then expanding them out over far larger areas and modifying them in various ways such that the final project looks nothing like the one that was first presented to the community. This completely undermines the functioning of the EP&A Act 1979 which is based on an assessment of the significance of environmental impacts. If only a small project is put up initially, and it is determined not to have a significant impact, then it doubles or triples, the assessment of impact on the extensions would be different to that for the whole project. However, under the current rules, the full impact would never have to be considered. For example, in the Pilliga forest, the current production proposal is for 1,100 wells and 1,000km of pipeline. However, extrapolating that proposal out across the whole Eastern Star Gas exploration licence (PEL238), where there is

²⁴ TWS, NCC, NICE. 2011. Under the Radar: How Coal Seam Gas Mining in the Pilliga is Impacting Matters of National Environmental Significance.

²⁵ Statement is quoted in the story at <http://www.abc.net.au/rural/telegraph/content/2011/s3274724.htm>

high and moderate coal seam gas potential, indicates that the full proposal might ultimately amount to 7,100 wells

This estimate was derived by using data developed by the Department of Mineral Resources in 2002 which included a map of coal seam gas potential across the Brigalow Belt South bioregion²⁶, which covers the Eastern Star Gas Narrabri exploration area. This information allows an analysis to be conducted of the likely extent of the full Eastern Star Gas Narrabri coal seam gas project, based on the size and intensity of the current proposal for the small portion of the petroleum licence that is covered by their current 'project area' for which a development application has been lodged. Map 3 shows the mineral potential across the region, and within both the Eastern Star Gas Narrabri exploration licence and the current Eastern Star Gas Narrabri 'project area'.

Analysing that map in a Geographic Information System, environment groups have derived the following statistics:

| | Total Area | Coal Seam Gas Potential (Mod-High) | Vegetated Coal Seam Gas Potential (Mod-High) |
|--|-------------------------------|---|---|
| ESG Narrabri Petroleum Titles ²⁷ | 821,875 hectares | 486,538 hectares | 216,950 hectares |
| ESG 'Project Area' | 85,000 hectares ²⁸ | 74,655 hectares | 65,101 hectares |

Therefore, the total area of moderate to high coal seam gas potential available to Eastern Star Gas in the exploration licence is 6.52 times the size of moderate to high potential in the current 'project area'.

Assuming that the density of drill holes will be the same, this can be used to extrapolate from 1,100 drill holes proposed in the project area to an estimated 7,172 drill holes that are likely to be sunk across the total licence area.

²⁶ NSW Department of Mineral Resources. 2002. Mineral and Petroleum Resources Potential, NSW Western Regional Assessments; Brigalow Belt South. A project undertaken for the Resource and Conservation Assessment Council NSW WRA, Project Number WRA/20.

²⁷ PEL238, PAL2 & PPL3

²⁸ As described in the Preliminary Environmental Assessment for the project

With regard to native vegetation, the total vegetated area with moderate to high coal seam gas potential available to Eastern Star Gas in the exploration licence is 3.3 times the size of the vegetated area with potential in the current 'project area'. Assuming that the intensity of impact on native vegetation will be the same, this can be used to extrapolate from 2,400 of native vegetation proposed for clearing in the current proposal, to an estimated 7,998 hectares of likely vegetation clearing across the total licence area.

The fact that such an expansion is likely is given further credence by the fact that ESG are currently exploring and operating pilot production wells within areas that are not in their current production proposal area. Legal reforms are needed to prevent the endless variations, modifications and expansions to proposals that undermine the application of the law and that mislead the community.

Review of reforms currently proposed by the NSW Government

Current reforms, both those already implemented and those proposed, by the NSW Government are not adequate to address the problems identified with CSG mining in this submission.

In fact, they clearly will not prevent the worst impacts of the coal seam gas industry on water resources, biodiversity and communities in NSW. Specifically, some of the key failings are that:

1. The emphasis on more administrative procedures, applied with considerable discretion, rather than strict prohibitions based on objective tests - for example, it seems that the Aquifer Interference Regulation is likely only to require an additional regulatory approval before drilling through an aquifer. In contrast, we believe the Aquifer Interference Regulation should prohibit CSG in all important aquifers, and that there should be no ministerial discretion to vary that.

2. There is a proposal to ban evaporation ponds, which is presumably to be implemented as part of the Aquifer Interference Regulation. However, there are many types of ponds that pose major environmental risks during CSG exploration and production - namely drill ponds, holding ponds and storage ponds. In the Pilliga, the exploration phase alone has involved the development of 13 major water storage impoundments, and only 2 of those would probably qualify as regular evaporation ponds. Most of the risks to the environment from toxic saline water will remain regardless - including the risks posed during extraction of the water from the seams due to leakage and soil contamination around the boreholes, the storage of the water in drill ponds, the transport of the water in pipes, and the storage of the water in impoundments which are at risk from overflow during rainfall events and which pose a hazard to wildlife. Therefore, merely changing the nature of the ponds that are allowed will not substantially address the problems with produced waste water from CSG.
3. The emphasis on more impact statements that are prone to being ignored and that do not contain objective tests. The NSW Government has promised to introduce Agricultural Impact Statements which require an assessment of impacts on agriculture from coal seam gas drilling, but again there is no clear objective test that will be applied to determine whether an activity will be approved. Experience shows that impact statements are routinely used as a basis on which to approve close to 100 per cent of developments.
4. They still do nothing to address the problems created by the fact that the proponents engage and employ environmental consultants, which creates a strong bias in favour of finding that there is no significant impact from the proposed actions.
5. The Strategic Regional Land Use Planning process is still an unknown. The concern is the length of time that it looks likely to take to roll out, and the fact that there are already close to 40 major mines in NSW that are in the planning process and will be dealt with under Part 3A anyway. Important areas at high risk from CSG, such as the Clarence Moreton Basin, are not included in the SLRUP areas.

6. The Namoi Water Study has been developed to provide a detailed hydrological model of the Namoi Catchment and to better quantify the cumulative impacts of mining on water resources. However, despite being located in the Namoi Catchment, the Pilliga is not included within the area that is being modelled for the Namoi Water Study. This is a major oversight that needs to be addressed, given the importance of the Pilliga as the southern recharge area of the Great Artesian Basin.
7. Future reforms to the EP&A Act 1979 are still unknown and their efficacy in addressing the many regulatory failings and inadequacies of the current system are in question.

THE IMPACT SIMILAR INDUSTRIES HAVE HAD IN OTHER JURISDICTIONS

In deciding on the feasibility of coal seam gas mining in our local area we can only draw on past and present examples in the interest of doing so accurately. Almost half of the 58 wells tested in May last year at QGC Kenya gas fields were found to be leaking. One was well over the explosive limit. This alone is unacceptable. A more recent state-wide audit of CSG wells in Queensland was undertaken where the results of which, according to Mining Minister Stirling Hinchliffe, showed that "98% of wells were safe". Another way of putting this is 2% were unsafe. When we consider the proposed magnitude of growth of the CSG industry and consider the sheer number of wells proposed for NSW alone, the surprisingly modest figure of 2% is suddenly a substantial number of wells, and represents a very real danger.

Any mining activity that infringes on the basic ownership rights of legitimate landholders and forces itself onto their property should be expected to be 100% safe. Clearly this is not the case. In May this year a well in Dalby exploded on the property of a farmer, Tom O'Connor. Tom O'Connor runs an irrigated and dry-land grain and cattle growing operation, including a feedlot. Saline water and gas, which has the potential to destroy his crops and contaminate his cattle feed, were shot ninety meters into the air. This was the fourth incident in five years on Mr O'Connor's property, which contains twelve CSG wells. This hardly fits the model of a safe

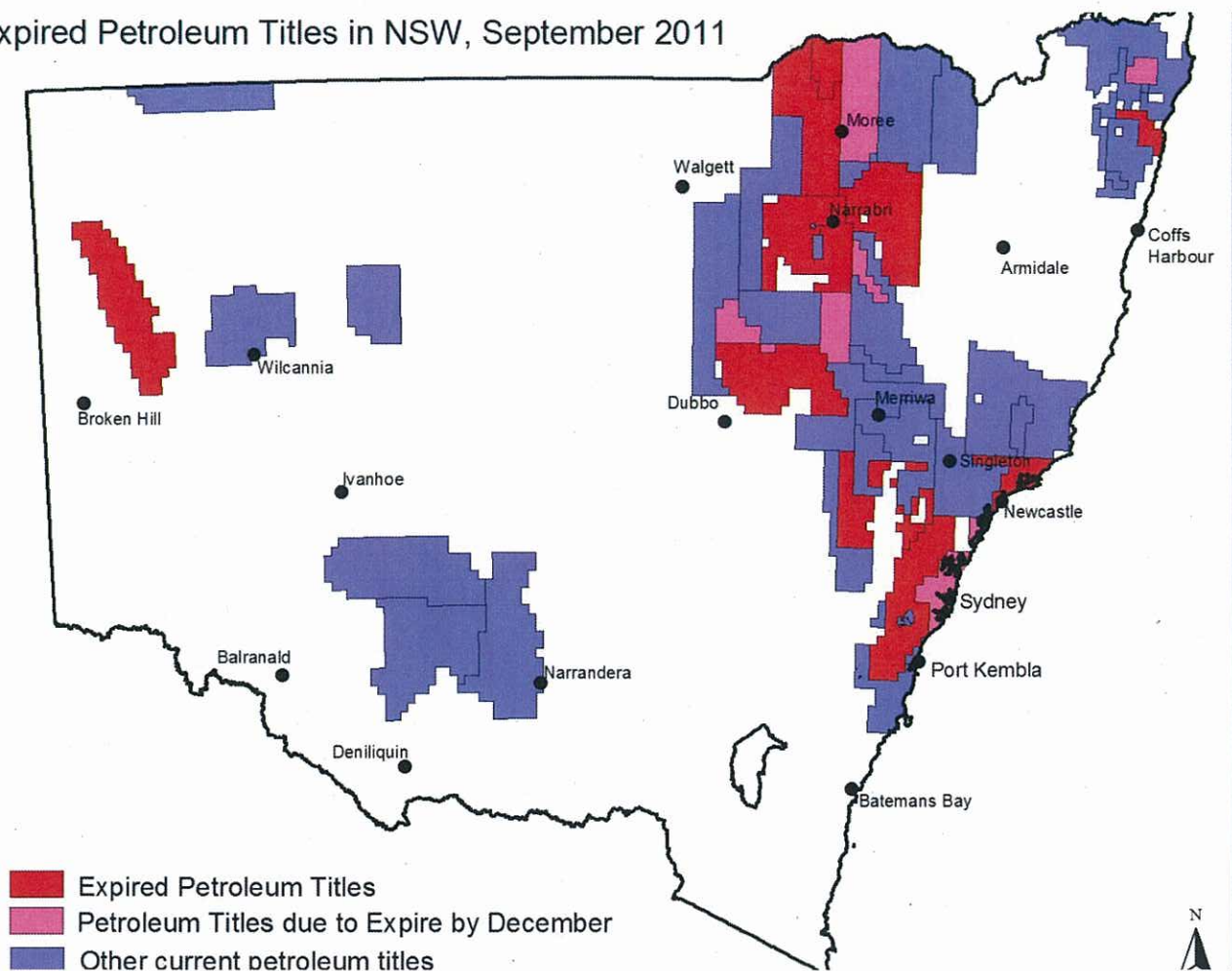
industry.

Based on the relatively long running CSG industry in Queensland, we can see a growing feeling of disempowerment among farmers and land owners who feel their communities and properties are at the mercy of CSG companies. The clearing of bushland and fragmentation of farmland is not only a physical erosion of landscape but leads to an erosion of the fabric of these communities. A pattern of growing social discord emerges wherever CSG mining is established.

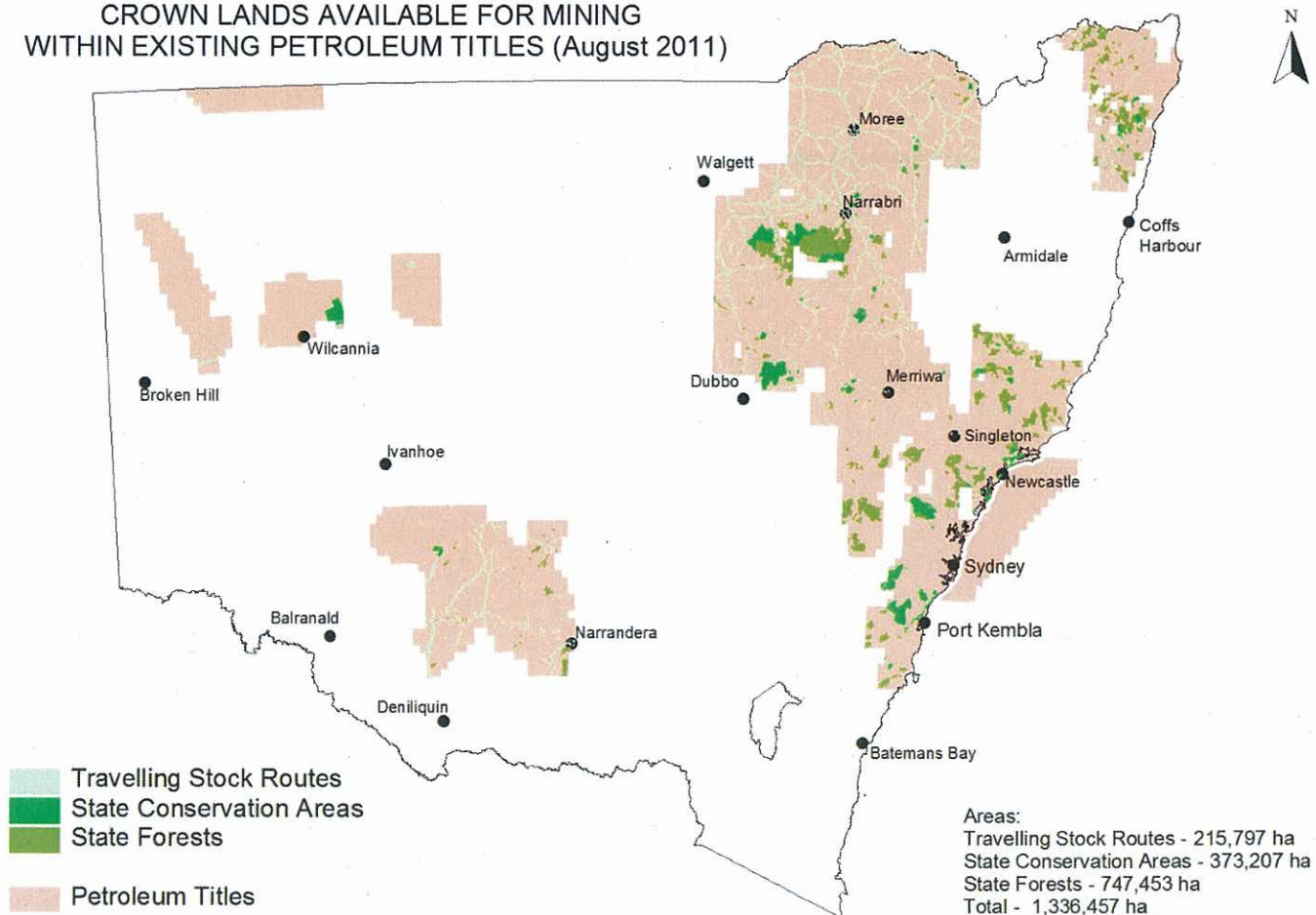
CSG mining is a relatively new industry in Australia, but if we draw on examples from countries such as the United States, who have been mining in this way for several decades, we see a long history of social and environmental catastrophes. Frequent wellhead explosions are perhaps the most graphic and disturbing of these, but no less disastrous are the incidences of contaminated drinking water, dropping aquifer levels, soil erosion and contamination, air contamination, poisoned livestock, poisoned communities and land eventually rendered completely unusable.

We are lucky that we have decades worth of information from other nations to provide us with a valid base on which to take a far stronger stance on CSG mining in this country. We must learn from those mistakes and put a moratorium in place until there is scientific evidence to prove that it is safe and that the recognised impacts can be avoided.

Expired Petroleum Titles in NSW, September 2011



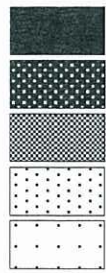
CROWN LANDS AVAILABLE FOR MINING WITHIN EXISTING PETROLEUM TITLES (August 2011)



Map 1: Coal Seam Gas Resource Potential in the Brigalow Belt South

60 0 60 120 Kilometers

Coal Seam Methane Potential



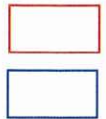
High

Moderate To High

Moderate

Low to Moderate

Low



Eastern Star Gas 'Narrabri' Petroleum Titles

Eastern Star Gas Narrabri 'Project Area'

WALGETT

BURREN JUNCTION

COME BY CHANCE

COONAMBLE

WEE WEA

NARRABRI

GUNNEDAH

MULLALEY

COONABARABRAN

WARRAMARR SPRINGS

WARRAMARR

DUBBO



CSG Potential Data obtained under licence from DMR. Petroleum titles obtained from DMR via MinView.