



CENTRAL LAND COUNCIL

Central Land Council Submission to the Hydraulic Fracturing Inquiry in the Northern Territory

Terms of Reference (Draft)

The proposed overarching statement of intention: Inquiry into hydraulic fracturing (fracking) of hydrocarbon deposits in the Northern Territory: Assessment of environmental risks; actual environmental impacts and effectiveness of mitigation measures.

Specific matters to be considered and addressed:

Historical settings

1. Historical and proposed use of hydraulic fracturing (exploration, appraisal and production) of hydrocarbon deposits in the Northern Territory (number of wells; locations; timeline).
2. Environmental outcomes of each hydraulic fracturing action for hydrocarbon resources in the Northern Territory (number of wells; frequencies of types of known environmental impacts).
3. Frequency of types and causes of environmental impacts from hydraulic fracturing of hydrocarbon deposits in the Northern Territory and from similar deposits in other parts of the world.
4. The potential for multiple well pads to reduce or enhance the risks of environmental impacts.

Northern Territory geology and hydrogeology

5. Relationships between environmental outcomes of hydraulic fracturing of shale petroleum deposits with geology, hydrogeology and hydrology.
6. Potential for regional and area variations in the risk of environmental impacts from hydraulic fracturing in the Northern Territory.

Management and mitigation

7. Effective methods for mitigating potential environmental impacts before, during and after hydraulic fracturing with reference to:
 - selection of sites for wells;
 - well design, construction, standards, control and operational safety and well integrity ratings;
 - water use;
 - chemical use;
 - disposal and treatment of waste water and drilling muds;
 - fugitive emissions;
 - noise.
 - monitoring requirements;
 - the use of single or multiple well pads;
 - rehabilitation and closure of wells (exploratory and production) including issues associated with corrosion and long term post closure;
 - site rehabilitation for areas where hydraulic fracturing activities have occurred.

1. Introduction

The Central Land Council (CLC) represents the interests of traditional Aboriginal owners (traditional owners) in the southern half of the Northern Territory covering an area of approximately 780,000 km². The CLC has statutory responsibilities under the *Aboriginal Land Rights (Northern Territory) Act 1976* (ALRA) and *Native Title Act 1993* (NTA) to consult with traditional owners over proposals for exploration and mining and, where instructed to do so, make agreements with mining companies which protect traditional owners interests.

The role of the CLC in processing the applications is four-fold:

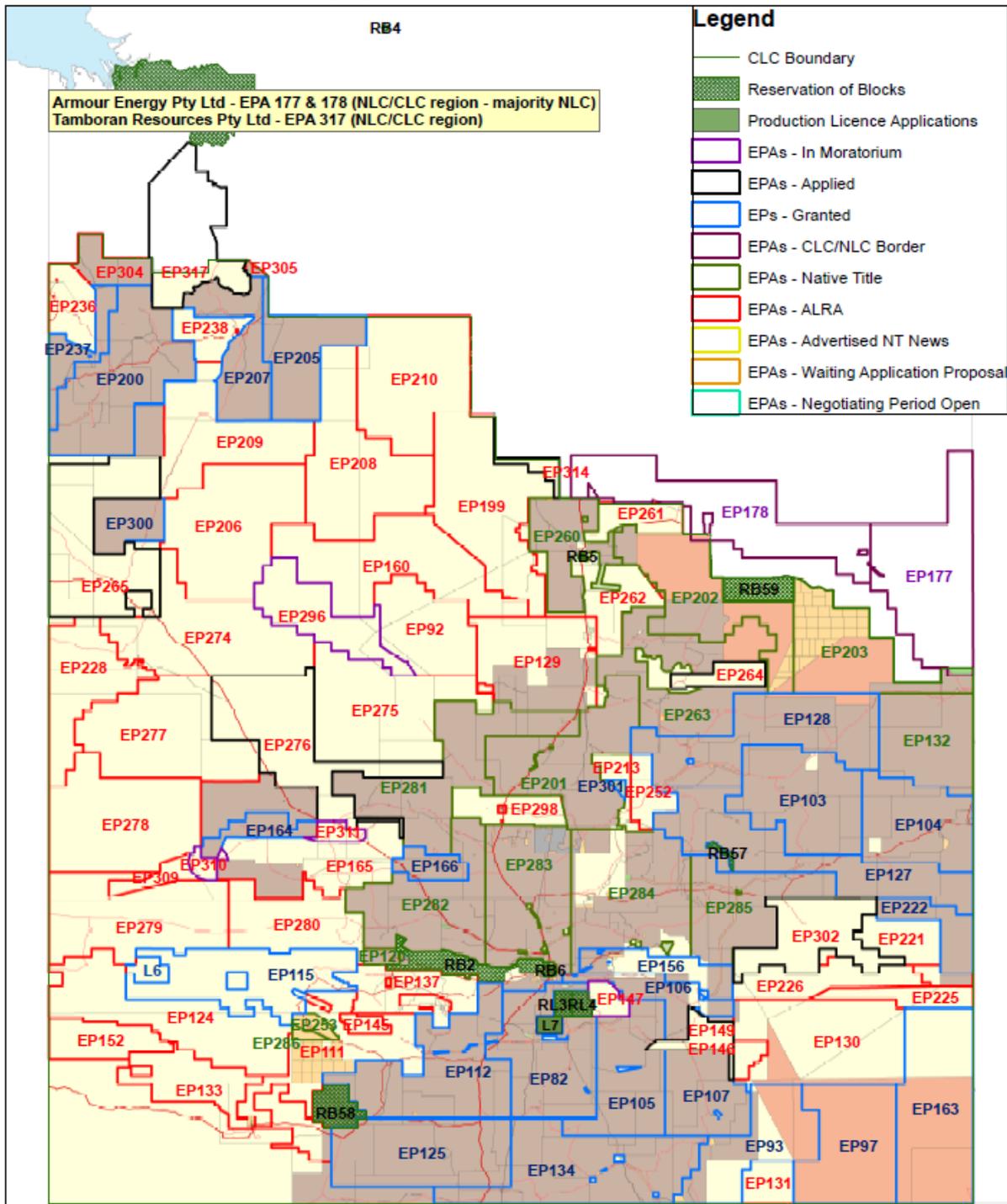
- identifying traditional Aboriginal owners;
- acting as adviser to the traditional Aboriginal owners, and on their behalf as an intermediary in negotiation;
- ascertaining traditional Aboriginal owner decisions;
- administering the resulting contracts.

The ALRA which applies to Aboriginal owned freehold land provides a best practice regime for consulting with traditional owners and protecting their rights and interests in relation to the processing of applications for exploration and mining. The system provides for informed group decision making by traditional owners in relation to proposals over their land. For Aboriginal land the traditional owners must consent to any exploration. Once consent is given by traditional owners to exploration, they cannot refuse any subsequent mining or production. For applications on pastoral leases, where the NTA applies, no consent provision exists. Rather, 'native title holders' have a right to negotiate terms for an agreement but cannot withhold consent to the grant of an exploration title.

Informed group consent of the traditional owners is fundamental to the CLC's consultation and agreement making processes for exploration applications regardless of the land tenure and despite traditional owners not having the right to say no for pastoral land.

Figure 1 below is a map of the CLC region showing Aboriginal land in yellow and pastoral lease in brown, as well as the current exploration permits (EPs) and applications (EPAs) for oil and gas. Granted petroleum exploration titles are shown in blue outline and petroleum applications in red outline.

EP/EP(A)s as at 11th June 2014



Source: Central Land Council

The focus of the CLC’s submission is to provide comment on those aspects of the oil and gas industry and hydraulic fracturing that have a direct impact for traditional owners and the statutory and contractual functions of the CLC. Firstly, comments relate to the volume of applications, the geological prospectivity of the application areas, the quality of the applicants and the CLC’s consultation processes. Secondly, comment is provided on policy and regulation and finally on operational concerns. Recommendations are included throughout the document.

Applications, applicants, prospectivity and the consultation process

Oil and gas production has a long history in the CLC region at Mereenie and Palm Valley west of Alice Springs where fields have been operating under ALRA agreements for many years. These fields are conventional plays but are considered tight (rocks with low permeability) and have been subject to fracture stimulation to enhance production. The CLC emphasises the differences between these historic experiences and the proposed unconventional plays targeting shale gas now under consideration.

The oil and gas rush in the Northern Territory was sudden and rapid with titles now covering most of the CLC region. The figures for applications are shown in the table below.

	NTA	ALRA
Pre 2011	7	14
Post 2011	17	25

Prior to 2011 there were 7 EPs on pastoral land and 14 on Aboriginal land. Post 2011 the numbers increased to 17 EPs on pastoral land and 25 on Aboriginal land. Applications for oil and gas include conventional targets and unconventional plays such as shale gas/oil and coal seam gas (CSG).

Consultation Process

The consultation task for the CLC for these EP/EP(A)s is enormous and complex. Virtually the entire CLC land area is subject to either granted oil and gas exploration permits or is under application. The size of the individual applications may be up to 16,000 km² each, covering multiple land trusts and Aboriginal language groups. The titles can involve 10 or 20 different estate groups needing to make decisions about one title. Furthermore, traditional owners for a given title may live in numerous communities located hundreds of kilometres apart. The logistics of bringing together traditional owners from these remote communities to discuss an application is complex and expensive. However the CLC is accomplished in this area and has already held numerous consultation meetings for some of these titles, with agreements in place with respect to some 15 EPs, mainly on pastoral land where traditional owners can’t say no. Many more titles are subject to ongoing discussion. Some TO groups are instructing CLC to negotiate agreements for unconventional gas and oil and their expectation is that the industry is well regulated and monitored and safe in Australia.

The CLC has a responsibility to ensure traditional owners are informed before making decisions about activities on their land. The CLC provides information and

assists with information flow about exploration and mining including the oil and gas industry by holding information sessions. These information sessions have been held in various communities and with some traditional owner groups. There are many more sessions planned. The CLC has a history of ensuring that balanced information is delivered to traditional owners in the case of contentious issues. All viewpoints are included and discussed. The CLC carried out an information strategy around uranium exploration and mining at the height of the uranium rush (2005 – 2008) and feedback from traditional owners was positive. The CLC is constantly seeking better information to use and opportunities to share that information. Clear, balanced and easy to understand audio-visual information is still lacking around oil and gas activities including hydraulic fracturing and the relationship between target rocks and groundwater.

Recommendation 1: The CLC requests all stakeholders develop better information related to the activities of the petroleum industry to use for information sessions with traditional owners, particularly audio visual material. A focus on the relationship between rocks, hydrocarbons and water resources would be helpful.

Speculative and unmeritorious applications

The Northern Territory, and indeed Australia, is notorious for ‘Blue Sky’ mining companies which spring up during mineral booms. One strategy of such companies is to peg prospective land and on-sell it to genuine explorers, extracting a payment which is a pure speculative gain. Where this on-selling works, it adds an extra cost to serious and resourced explorers, but when it does not work it means that the “Blue Sky” companies are effectively excluding the area from exploration by others.

With the oil and gas rush the NT is currently experiencing, speculative behaviour is anticipated and the processing of applications in these circumstances is frustrating for the CLC and traditional owners alike. The result can be stalled engagement, significant delays in the progress of negotiations and the requirement for further or ongoing traditional owner meetings as information and title holders change.

Most oil and gas applications in central Australia target the large sedimentary basins (Amadeus, Georgina and Wiso) in search of hydrocarbons and coal. However many applications appear to be indiscriminately made over metamorphic and igneous terrains where there is no prospect for oil and gas including the Arunta, Tennant Creek and Petermann Inliers. The map below shows the geology of the Northern Territory including the great sedimentary basins and the Inliers. Both terrains are targeted for exploration and there is a question around whether the applications have been screened or if they are genuine over the hard rock Inliers.



Source: Northern Territory Department of Mines & Energy¹

The CLC has limited resources to consult over exploration and mining which should not be wasted on consultations for applications that are only speculative. The vast areas covered by EPs require large complex meetings which are expensive to hold. The CLC recommends that an expert review of the applications be made to assess the technical and financial capacity of the applicants and the geological prospectivity of the application area in relation to the target commodity. Triggering the consultation process in the absence of such a screening process is a waste of time and resources for the CLC and traditional owners and can cause significant anxiety among families and build up expectations that are unlikely to be realised. It can also

¹http://www.nt.gov.au/d/Minerals_Energy/Geoscience/index.cfm?header=Geology%20of%20the%20Northern%20Territory

lead to a harboured resentment from traditional owners towards exploration which could make it more difficult for future legitimate applicants.

DMEs new competitive approach for available acreage is acknowledged although it came too late for the initial rush. However, non-performers may have titles refused and the ground will become subject to the competitive process enabling quality applicants.

Recommendation 2: Applicants should be screened and approved as suitable and capable to commence exploration by the NTG.

Recommendation 3: Applications should be screened and prioritised according to prospectivity by the NTGS. Speculative applications/applicants should not be prioritised. Exploration proposals similar to those required under s41(6) ALRA should be submitted to the CLC for applications on pastoral land.

Recommendation 4: Engagement by companies with the CLC requires ongoing monitoring by the DME and ability to refuse the EP for non-performers.

The time frame for processing these applications given their vast size is another challenge for the CLC. The consultation processes within the CLC for ALRA and NTA applications are largely aligned internally except the two processes have different timeframes. The ALRA prescribes some 22 months for processing an application with extensions to the time by agreement with the company. The NTA does not allow for this length of time with only several months at best. Fortunately, the NT DME has slowed down processing of EPAs which has allowed a right to negotiate style of approach for many licences, although several applications were granted at the beginning of the rush without consultation meetings or indeed any discussion with the CLC. The CLC would appreciate if work under these licences not be approved until the CLC has the opportunity to consult with the traditional owners.

Recommendation 5: Where EPs have been granted without an agreement work should not be approved until traditional owners have been consulted and an agreement is in place.

There are many granted EPs on pastoral land that are the subject of agreements between a company and the CLC, and many more applications under consideration. The work priorities for the CLC in processing the many applications is set on the basis of engagement by companies or where other priority work with the same traditional owner groups is planned. The CLC seeks to package titles to reduce the impact of meeting schedules on the traditional owners, particularly elderly senior traditional owners and to seek efficiencies in costs in holding meetings, and to minimise the physical impact on traditional owners and staff alike from regular remote travel. If companies approach the CLC wishing to progress titles, consultation meetings are prioritised although a strategic approach is preferred by

the CLC for calendar planning and allocation of necessary resources. The size of the titles often means that several consultation meetings may be required to deal with a given title.

Recommendation 6: CLC and DME have regular meetings to discuss a more strategic approach for processing the many applications.

Regulation and Policy

It has been acknowledged broadly that the current Petroleum Act and regulations do not adequately cover unconventional oil and gas exploration and production and the specific requirements around intensive use of hydraulic fracturing. The CLC supports better regulation for the petroleum industry particularly around operational matters in using hydraulic fracturing for unconventional targets. The Northern Territory Government (NTG) is currently reviewing the onshore regulation of petroleum and gas exploration in the Northern Territory (NT) and according to its website, the Department of Mines and Energy (DME) introduced a number of interim regulatory requirements to apply to all future petroleum activities, ensuring the regulation of current petroleum exploration activities meets leading regulatory practices².

Currently the environmental assessment and monitoring of petroleum activities is not a transparent process although there appears to be accepted interdepartmental administrative procedures in relation to the Environmental Assessment Act and the Water Act. There are benefits around incorporating these protections into legislation for purposes of clarity, consistency and transparency. The current approach to environmental assessment for drilling is a well by well approach. However, with increased well development which is associated with shale gas exploration and production, a regional and cumulative approach is essential. For example a spill or leakage from one well could migrate into the groundwater and become a more regional problem, therefore the impact on an aquifer from hydraulic fracturing must be considered with respect to total wells not individual wells. A regional impact assessment and baseline study before, during and after the commencement of activities for any unconventional play should be conducted. There are concerns around relying solely on Environmental Impact Assessment (EIA) at the development stage which can lead to a slow death across a catchment area³. A strategic approach that focuses on the cumulative impacts of many wells in a region on groundwater, soils, biota, communities, sacred sites and habitats is more robust⁴.

Recommendation 7: The Petroleum Act requirements should be consistent with the Environmental Assessment Act and the Water Act.

² http://www.nt.gov.au/d/Minerals_Energy/index.cfm?header=Legislation%20Review%20-%20Petroleum

³ Williams, J., (2012), “An Australian perspective on governance and regional strategic planning” in proceedings of *Unconventional Gas Production and Water Resources, Lessons from the United States on better governance – a workshop for Australian government officials*, Crawford School of Policy at the Australian National University.

⁴ Anderson, S., (2012), “An environmental perspective on better governance of gas production and water resources” in proceedings of *Unconventional Gas Production and Water Resources, Lessons from the United States on better governance – a workshop for Australian government officials*, Crawford School of Policy at the Australian National University.

Recommendation 8: Well development and hydraulic fracturing should be subject to regional EIA and not a well by well approach.

The rapid development of the industry and escalation of activity on the ground will require greater capacity and skill within the NT DME. The situation may be manageable while there are several wells subject to hydraulic fracturing but if there are hundreds or thousands of wells, as anticipated, the DME team will not be able to manage the work. There are also concerns around the independence of DME given its role to promote oil and gas exploration in the NT and its future possible involvement in marketing of gas (personal communication with DME, 2014).

The lessons from the Montara oil and gas leak off the coast of WA in 2009 while under the control of the then NT Department of Resources suggests complacency by both the regulator and operator as contributing factors, and that the company's approach was far from sensible oilfield practice and was an accident waiting to happen. Further, that the NTG used a 'tick and flick' approach to its regulation and is too small to manage regulation and oversight of the oil industry⁵.

Although changes have occurred within the DME and around off-shore well regulation, the concern over the size of the DME and the number of staff and their skills remain valid when contemplating a shale gas industry in central Australia.

Recommendation 9: The Australian Government monitor the capacity of the DME in the NT and provide additional support to maintain a high level of regulation.

Recommendation 10: External independent scrutiny over DME regulation is essential to allay concern over a perceived lack of independence.

Recommendation 11: Reporting on the location of wells subject to hydraulic fracturing including water monitoring data should be made public.

Operational concerns

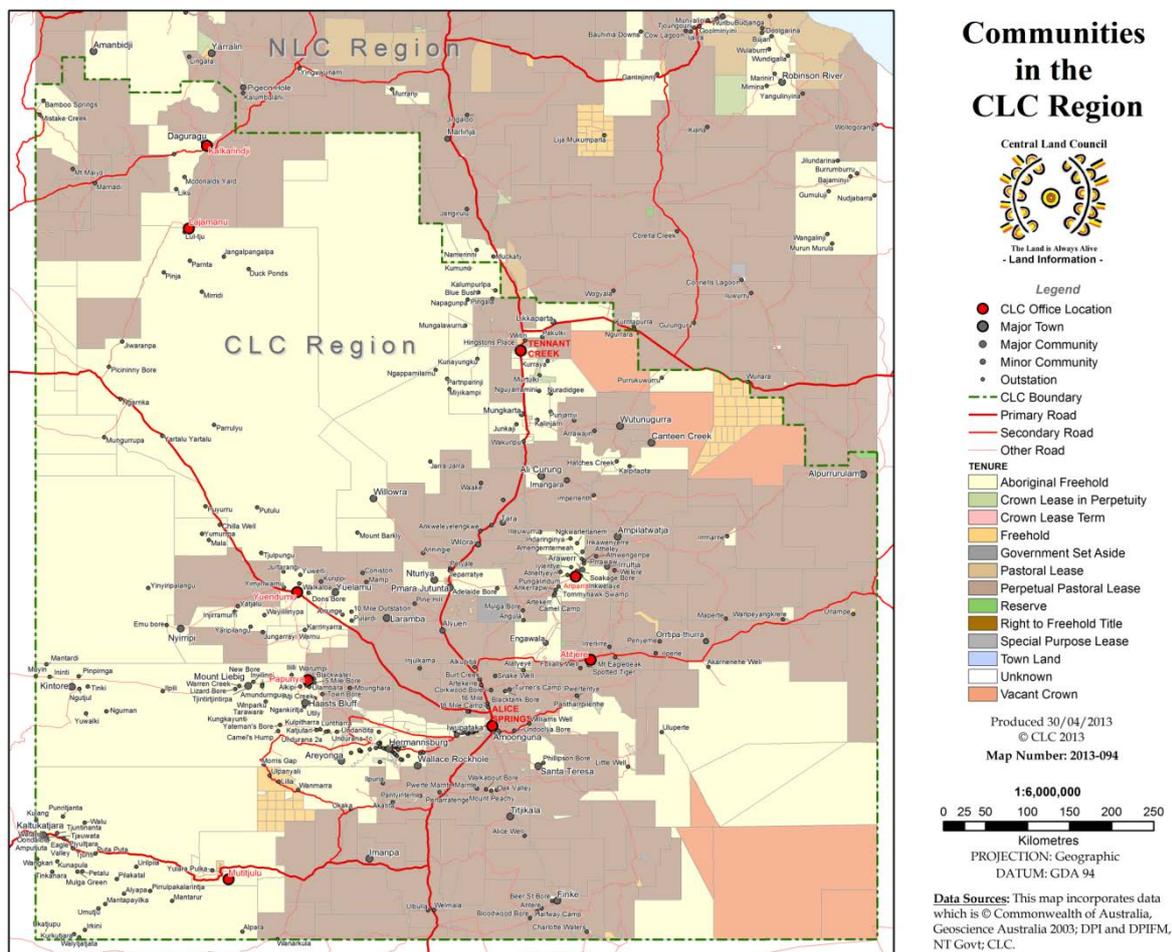
The main concerns raised by traditional owners about the oil and gas industry and the use of hydraulic fracturing include protection of water supplies with respect to both quality and quantity, protection of country including animals and plants and human safety. Some of the questions traditional owners have asked at meetings include: "Will houses explode (like on TV)? Will earthquakes occur? Can the pipelines explode? Will gas get into our drinking water? Will the company use all the water? If our young people work on the drilling, would there be accidents or explosions? How can we be sure the fractures don't go too far?"

The development footprint of an unconventional gas field which could expand into many thousands of wells extending across a large area is a challenge for traditional owners to foresee or visualise.

⁵ <http://www.theoil drum.com/node/7193>

Groundwater

Protection of ground water is the greatest concern because the source of virtually all water supplies in the CLC region is under ground. Territory towns, communities and stations all rely entirely on groundwater for their drinking supplies. Pastoral, tourism and horticultural activities are also reliant on groundwater. Any effect on water quality or quantity may be catastrophic and is obviously cause for great concern. The map below shows the location and distribution of Aboriginal communities across the CLC region. Some communities already struggle with a sustainable water supply. Sharing of water in these cases is not considered an option. For example Wunara, Alyuen, Yuelumu, Kintore and some outstations around Yuendumu have all had and continue to have issues over the community water supply. There are concerns over the protection of groundwater given the potential scale of shale gas exploration and production which can target a host shale unit across vast areas of a sedimentary basin.



Source: Central Land Council

Hydraulic fracturing uses large volumes of water for each fracture event. Companies should be required to demonstrate that the use of water in relation to a project will not have any adverse impact on local water resources in respect of other users.

Where there is conflict with potable supplies in use for communities, a company should be required to find an alternative water supply for its operation.

With respect to groundwater quality, the use of chemicals in hydraulic fracturing must be demonstrated to pose no risk to the quality of a community water supply or regional aquifer, and fracturing events should be managed so that no water supply will be at risk from contamination by oil and gas or chemicals. Again the sheer potential scale of a shale gas operation creates concern over potential pollution of groundwater. Potential contamination may come from well failure, stimulating fractures/faults and poor handling of produced water⁶.

Detailed information about the chemicals operators intend using for hydraulic fracturing should be made available to the public in relation to each operation.

The experience of unconventional hydrocarbon production from shales such as is predominately proposed in the NT is limited in Australia. Lessons can be learned from the coal seam gas experience in the Eastern States where contamination of aquifers and surface water from interaquifer flow (unlikely in deep shales), well failure and accidents on site have posed the greatest threats to acceptance of fracking. However, in Australia the primary effect on groundwater is likely to be abstraction of water for use in fracking as most of the shale gas basins are in arid areas such as the NT.⁷

Fracking operators usually prefer to use fresh or brackish water⁸. This brings current methods of fracking directly in competition with other existing water users such as pastoralists and traditional owners. A report by Frogtech notes that the volume of water required for hydraulic fracturing of shales in Australian conditions is not yet understood.⁹ More information is needed on groundwater baselines and ground water behaviour at depth. Studies should include the under researched field of stygofauna ecology and the impacts/risks from activities associated with the petroleum industry.

Recommendation 12: A coordinated regional assessment of groundwater resources in the CLC region should be conducted with specific reference to the shale gas industry and the development of guidelines around sustainable commercial uses having regard to existing and possible future uses.

Recommendation 13: Petroleum legislation should prohibit the use of community water supplies for hydraulic fracturing and an alternative water supply should be sought.

Recommendation 14: Legislation should include the requirement that full and transparent listings of all chemicals to be used in an operation be made readily available to the public as well as that chemicals are handled, stored, transported and used in a safe, and environmentally appropriate manner.

⁶ FROGTECH, (2013), *Potential Geological Risks Associated with Shale Gas Production in Australia*.

⁷ Ibid.

⁸ Ibid.

⁹ Ibid.

Protection of country

There are concerns over the protection of country including landforms, surface water places such as rock-holes, springs and soakages and groundwater, plants and animals. Petroleum activities involve land disturbance, clearance of vegetation, managing waste water, chemicals and hydrocarbons and establishing operations and villages in potentially pristine environments. There is concern over the footprint of a shale gas production field where an array of wells is required. The CLC and some traditional owners are familiar with the footprint of the Mereenie Field for example, which covers a single stratigraphic geological structure and involves nearly 50 wells. Visualising a shale gas field over an entire sedimentary basin is however challenging. In this event, concern over impacts from infrastructure and well development on biodiversity and threatened species are very real. Transporting product and chemicals on country and through or near communities is a concern - an example being the spill of a chemical on 27 May 2014 whilst being transported to a well site along the Plenty Highway. There is also concern around animals coming into contact with chemicals or contaminated water particularly around drilling sumps and evaporation ponds.

Sacred sites may be parts of the natural landscape such as hills, rocks, trees, springs and may not always be interesting or spectacular to the non-Aboriginal eye. They may be places that are significant because they mark a particular act of a creation being. They are also burial grounds and places where ceremonies have been held. Sacred sites are often linked by the stories of a travelling ancestor being and as such can link groups of Aboriginal people across vast areas of the continent¹⁰. With respect to exploration and mining activity in the CLC region, sacred site protection is a matter dealt with through detailed procedures under agreement between the CLC and a company. Where there is no agreement, sacred sites are able to be protected under the *Northern Territory Aboriginal Sacred Sites Act, 1978*. Intensive exploration and mining activities are a concern for traditional owners and custodians of sacred sites in areas where there is a major development even when sites are protected. However concern is lessened where processes to protect places are followed. Agreements between the CLC and a company enable ongoing engagement and liaison so traditional owners are regularly updated about a project. Nevertheless, industrial activity and use of natural resources does cause anxiety over real or perceived impacts on country and culture. For traditional owners water and country is not just vital to life but closely tied to culture and heritage which the ALRA and NTA were designed to preserve and protect.

Recommendation 15: Baseline environmental studies should be conducted for all sedimentary basins targeted by the oil and gas industry, so EIA can be completed and better data obtained for strategic planning. The data should be updated as required to identify trends.

¹⁰ <http://www.clc.org.au/articles/info/sacred-sites-in-the-northern-territory>

Safety

Traditional owners are concerned about the possibility of explosions and earthquakes in relation to oil and gas production and hydraulic fracturing. Explosions are catastrophic events which are rare and if a company follows best practice procedures, should not occur.

Literature on hydraulic fracturing and seismicity does acknowledge a risk although small. Induced seismicity from uncontrolled fracture propagation is a potential risk of shale gas production¹¹. Seismicity can occur in all three of the major phases of fracking operations; when stimulating reservoirs, when withdrawing the injected fluid to allow gas flow and finally when reinjecting flow back fluid for storage¹². In the UK seismic events occurred near Lancashire and this has led to strong recommendations by the Royal Society and Royal Academy of Engineering¹³ that strict regulations be developed before fracking continue in the UK. The recommendations also highlighted the need for studies to characterise the geological and hydrological systems of unique areas before during and after fracking and to develop applicable strategies to govern other known technical hazards such as faults or vulnerable groundwater¹⁴. A report to the office of the Chief Scientist in New South Wales has stated that monitoring and regulation of seismicity is presently inadequate¹⁵.

Fracking if improperly carried out, may cause low level earthquakes. However, out of the tens of thousands of wells drilled for shale gas thus far there have only been a few documented examples of induced seismicity due to fracking. Risks may be lowered by understanding natural faults, fractures and stress directions¹⁶. Earthquakes, tremors and crustal movements have occurred in central Australia, for example in the Tennant Creek area the natural gas pipeline was damaged as a consequence of three earthquakes on January 22, 1988 therefore seismic risk needs to be properly considered.

Recommendation 16: Areas the subject of seismic risk could be identified and evaluation work conducted prior to any fracturing followed by monitoring during and after the activity.

Well integrity

Development and construction of wells to be subject to hydraulic fracturing have specific requirements with respect to best practice which should be dealt with in legislation. Indeed this is widely accepted including in the USA where well integrity is

¹¹ Healey cited in International Risk Governance Council, (2013), *Risk Governance Guidelines for Unconventional Gas Development*

¹² International Risk Governance Council, (2013), *Risk Governance Guidelines for Unconventional Gas Development*

¹³ Royal Society cited in International Risk Governance Council, (2013), *Risk Governance Guidelines for Unconventional Gas Development*

¹⁴ International Risk Governance Council, (2013), *Risk Governance Guidelines for Unconventional Gas Development*

¹⁵ Rawling, T., and Sandiford, M., (2013), *Multi basin usage/cumulative impact (background paper for the office of the NSW Chief Scientist and Engineer, Melbourne Energy Institute University of Melbourne*

¹⁶ FROGTECH, (2013), *Potential Geological Risks Associated with Shale Gas Production in Australia.*

of the utmost importance and the design, installation and monitoring of wells to be fracked must be ensured by regulation (Mark Boling)¹⁷.

Some traditional owners have heard presentations from companies where assurances were given around practices and the regulation of hydraulic fracturing, including the adoption of new rules as result of the NT regulatory review and fracturing inquiry. The expectation is that fracturing activities can and will be carried out on the land in a safe and responsible way.

Again the CLC highlights the concern raised about protection of groundwater and the priority such protection requires when considering a shale gas industry.

Recommendation 17: Well integrity matters need to be included in the legislation and there needs to be consistency between the Petroleum and Water Act.

The CLC strongly supports certification of companies involved in hydraulic fracturing especially in the current climate of expediency around unconventional hydrocarbons. The Association of Learned Academics (ACOLA) notes that there are skill shortages in some areas of shale and gas production which will need to be addressed¹⁸. This suggests that without strong legislation from government to prevent it we may see a rush of poorly prepared operators looking to exploit these resources without the appropriate abilities to maintain acceptable standards. The rush to extract increases the likelihood of incidents. Further if all of the current EPs were to be subject to exploration there would not be anywhere near the infrastructure and plant in Australia at present to capitalise.

Recommendation 18: Mandatory certification of operators and contractors involved in hydraulic fracturing should be a regulated requirement.

Summary comment

The CLC is continuing to process applications because it is the organisation's statutory role to do so and because TOs are seeking opportunities to gain benefit from such activity, but there remain concerns over the nature of the industry, the possible scale of the industry in the future, conflicts over water supplies and land use and the effectiveness of the regulatory framework. There is a rush and it is important that processing of titles and approvals don't get too far ahead of the capacity to regulate and the current scientific understanding of the long term effects of the industry.

¹⁷ Boling, M., (2012), "Unconventional gas production and water resources: lessons from the U.S." in proceedings of *Unconventional Gas Production and Water Resources, Lessons from the United States on better governance – a workshop for Australian government officials*, Crawford School of Policy at the Australian National University

¹⁸ Australian Council of Learned Academics, 2013, *Engineering Energy: Unconventional Gas Production – A study of shale gas in Australia*.

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