



SCIENTIFIC INQUIRY INTO
HYDRAULIC FRACTURING
IN THE NORTHERN TERRITORY



Draft Final Report

January/February 2018

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Chapters 1-3
Purpose, work and findings
of the Inquiry



What we have done

- We have met 10 times
- We went to see a frack at Moomba in South Australia
- We have released a *Background and Issues Paper*
- We conducted hearings and community meetings in March 2017
- We went to Queensland and spoke to people affected by CSG and visited a gas field
- We consulted pastoralists and visited stations
- We visited gas fields in Mereenie
- We released an *Interim Report*
- We conducted more hearings and community meetings in August 2017
- We released the ACIL Allen economics report and the Coffey reports
- We released the *draft Final Report* in December 2017 including recommendations



What we will do next

- Conduct a final round of community and remote consultations, including public hearings, where we will explain the main findings and recommendations of the draft Final Report
- Listen to what people have to say about the draft Final Report and draft recommendations
- Consider more submissions received
- Revise the draft Final Report, including recommendations
- Report to Government in March 2018

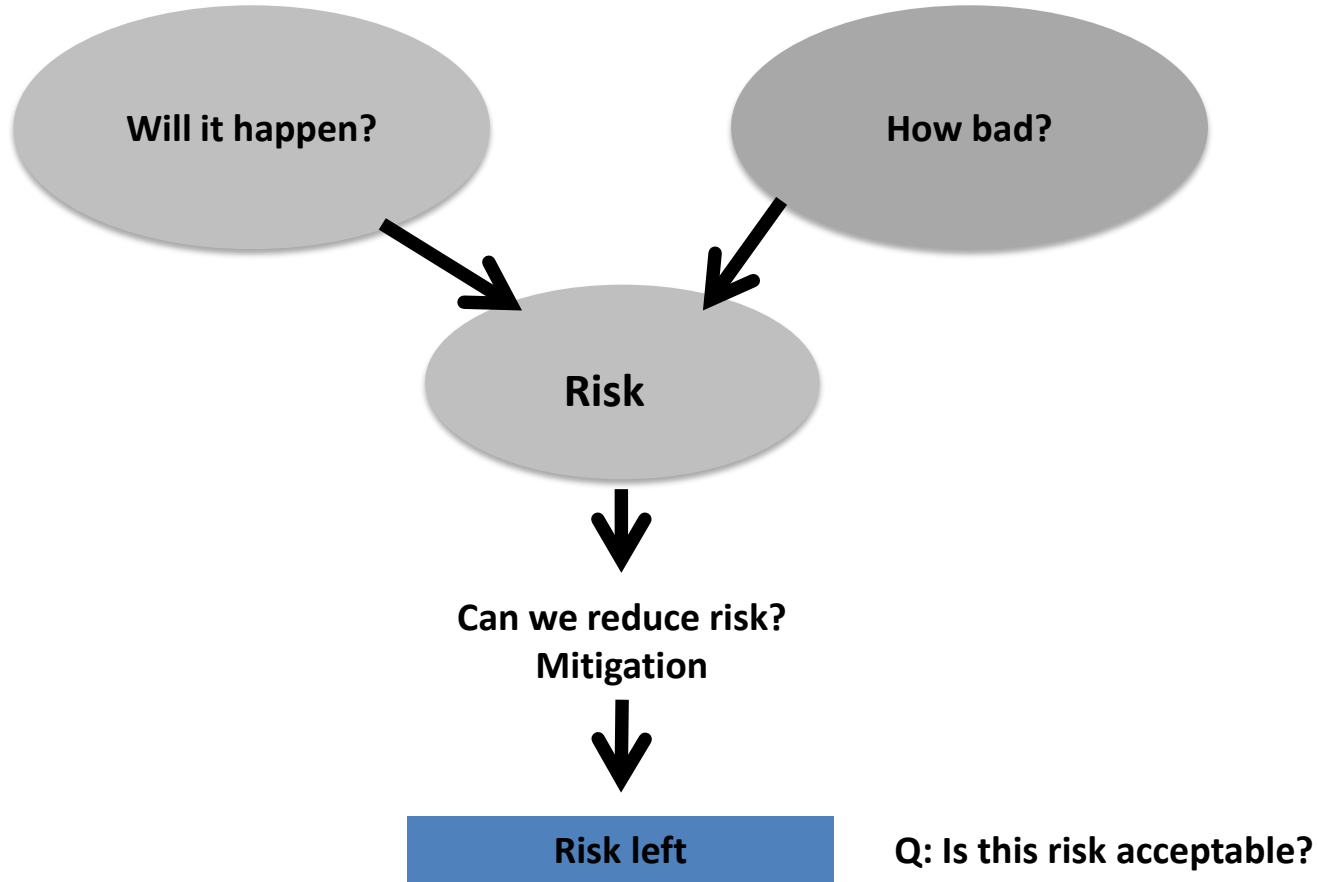
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Chapter 4

Evidence and Risk Assessment Methodology

Risk assessment



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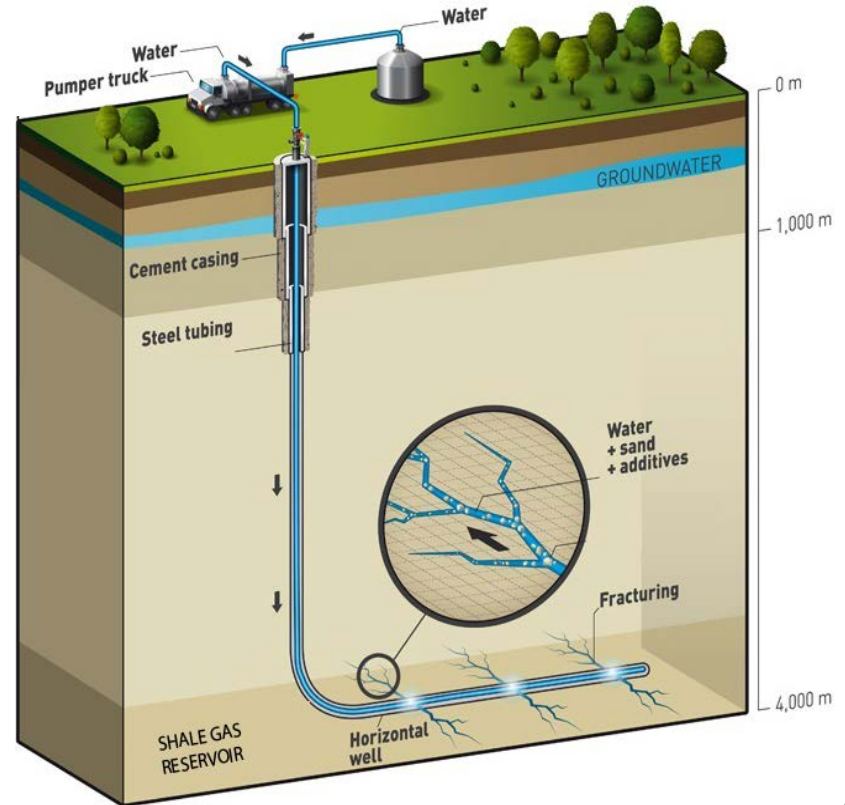


Chapter 5

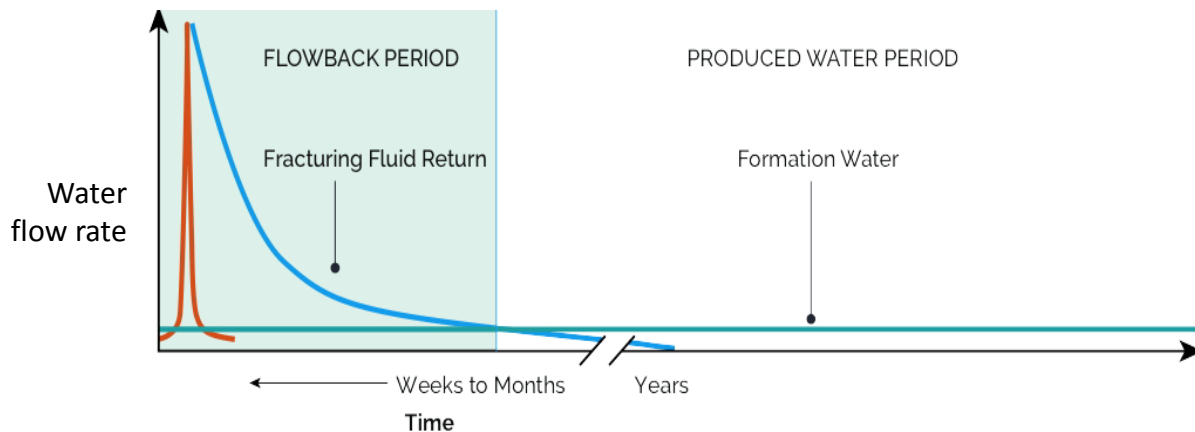
Shale Gas Extraction and Development

Well life cycle

- Design phase
- Construction phase
- Hydraulic fracturing
- Operation/production
- Decommissioning and abandonment



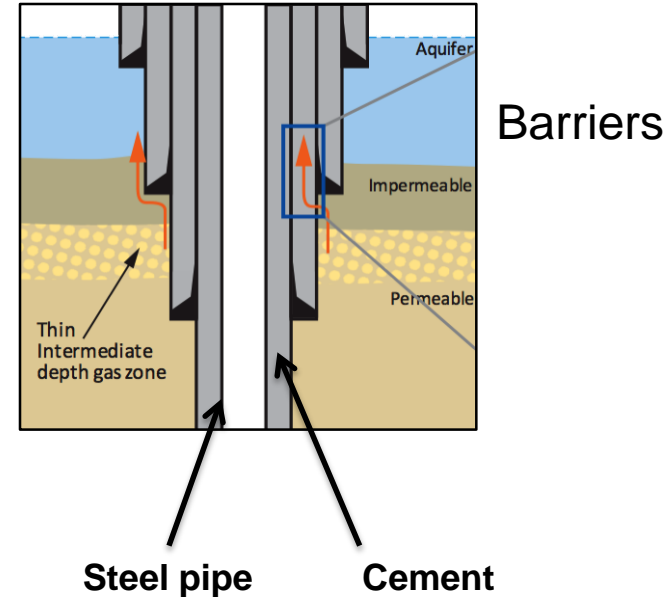
Wastewater



- Sources:
 - *Flow back water* – return from hydraulic fracturing (weeks to months)
 - *Produced water* – over the lifetime of the well
- Potential for re-use of flowback water
- Composition:
 - Fracking chemicals
 - Chemicals from the shale layer

Well Integrity

- Very important for safe operation and to ensure that groundwater is not contaminated
- Two types of failure:
 - Well barrier failure – one barrier fails but no loss of fluids
 - Well integrity failure – all barriers fail and fluids can flow into and out of the well – may result in groundwater contamination
 - Failures can be related to bad casing and/or cement
- We asked CSIRO to conduct in-depth world-wide review of well failure. CSIRO review found:
 - All barriers failure rates were typically less than 0.1% of wells
 - Single barrier failure rates much higher (1-10%) in the past but now rare for good quality constructed wells (Category 9 or above)



Well Integrity - recommendations

- That the Government develop and mandate enforceable code of practice – minimum requirements (**Rec 5.3**)
- That gas companies develop and implement a well integrity management system for each well (**Rec 5.4**)
- Develop code of practice for abandonment of wells, with on-going monitoring (**Recs 5.1 and 5.2**)

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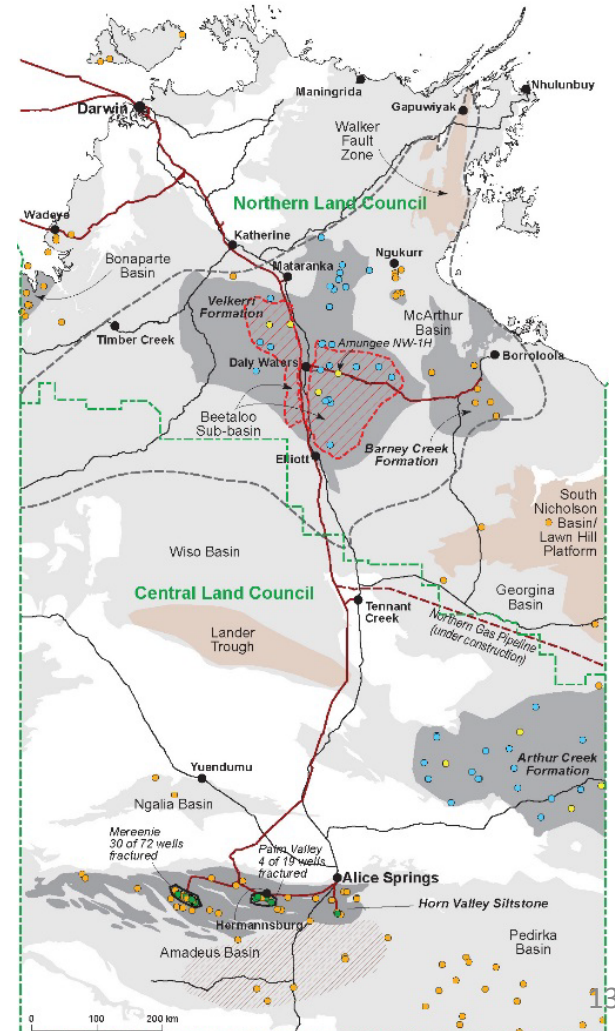


Chapter 6

Onshore shale gas in Australia and the NT

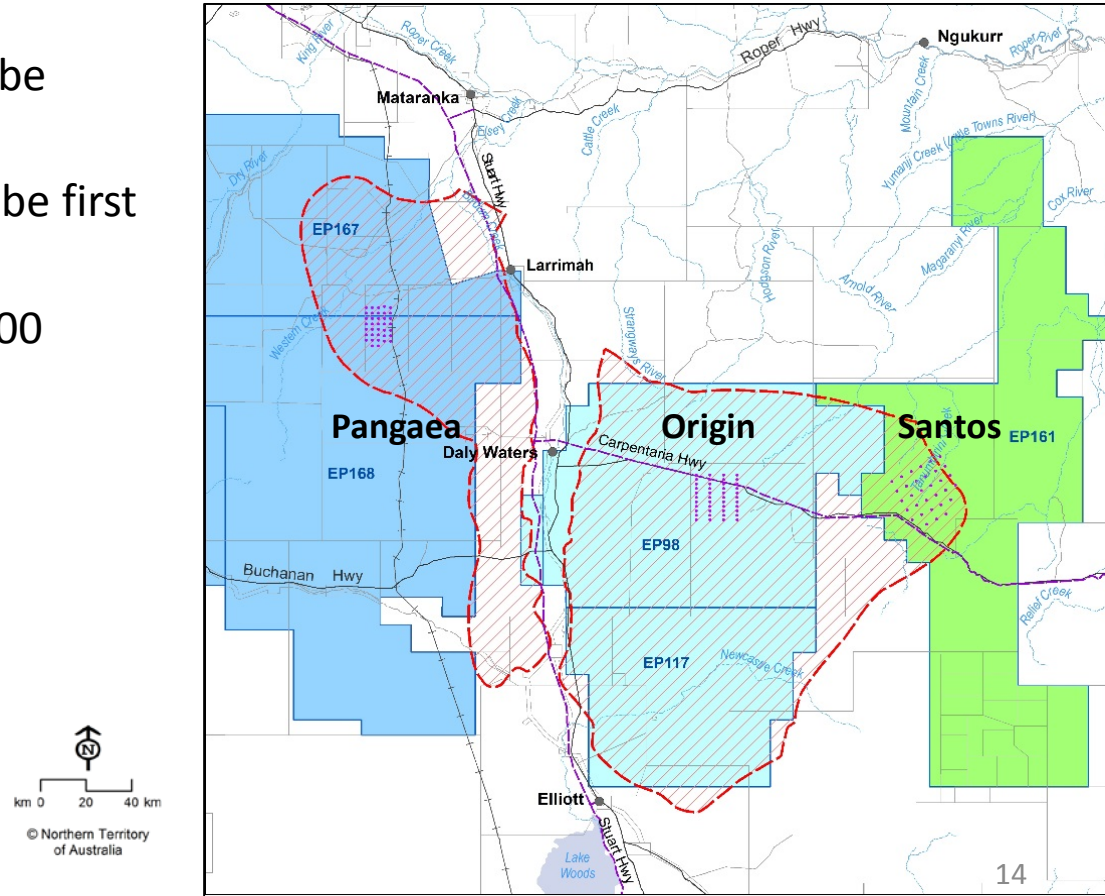
Where is the shale gas?

- Six major basins
- Most unexplored
- ~ 70% of the total shale gas is in the Beetaloo Sub-basin



What might development look like?

- 1-2 shale gas resources might be developed in next 5-10 years
- Beetaloo Sub-basin is likely to be first
- Industry estimates between 1,000 – 1,200 wells and 150-200 drilling pads in Beetaloo



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Chapters 7 and 15

Water and SREBA

Water

- Need acceptable protection of surface and groundwater resources:
 - Water supply (quantity)
 - Water quality (contamination)
 - Aquatic ecosystems
- Four high-priority issues:
 - Unsustainable groundwater use
 - Contamination of groundwater from leaky wells
 - Contamination of groundwater by surface spills of frack fluid chemicals (in transit or storage) and wastewater
 - Effects on surface or groundwater-dependent ecosystems

Water supply

- Shale gas industry likely to use groundwater
- Industry in Beetaloo Sub-basin likely to use 2,500-5,000 ML per year (1,000-2000 Olympic swimming pools)
- Need Strategic Regional Environmental and Baseline Assessment (**SREBA**) (**Recs 7.4, 7.18 and 7.19**)
 - Better information on groundwater (recharge, movement)
 - Better information on groundwater-dependent ecosystems such as Mataranka springs



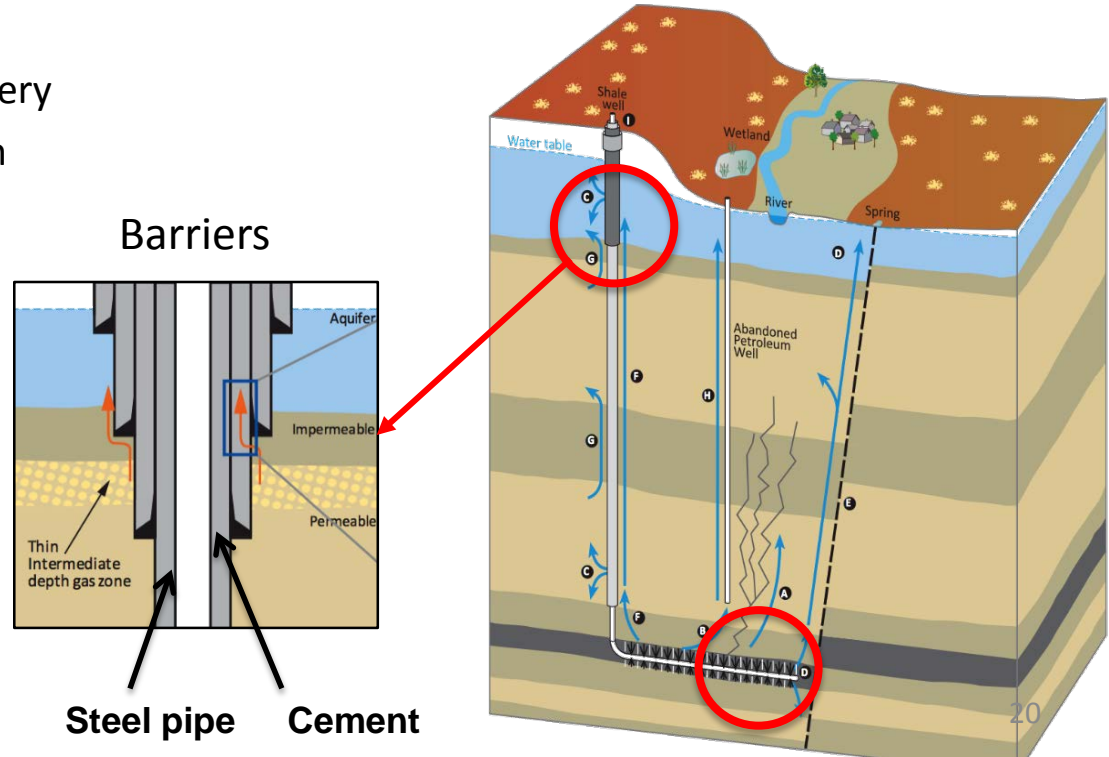
- Gas companies become subject to the Water Act (need to obtain a licence, and pay for the water they extract) (**Rec 7.1**)
- Changes to water management (e.g. Water Allocation Plans) (**Rec 7.6**)
- No taking of surface waters (rivers, lakes, wetlands) (**Rec 7.5**)
- Restrictions on the distance between gas company supply bores and domestic or pastoral water bores (**Recs 7.7 and 7.10**)

Water quality

- Key issue is to ensure shale gas wastewater does not pollute surface or groundwater
- Minimise the risk of contamination from:
 - Wastewater and chemicals (flowback water and produced water)
 - Methane – not toxic, but a greenhouse gas
- Panel focused on two main potential contamination pathways:
 - Leaky wells (well integrity)
 - Surface spills

Two main contamination pathways

- Leaky well - where it goes through the aquifer (multiple metal and cement barriers)
- The hydraulic fracturing area – very large distance (2 - 4km) between fracturing and surface aquifers



Risk of contamination by well integrity failure

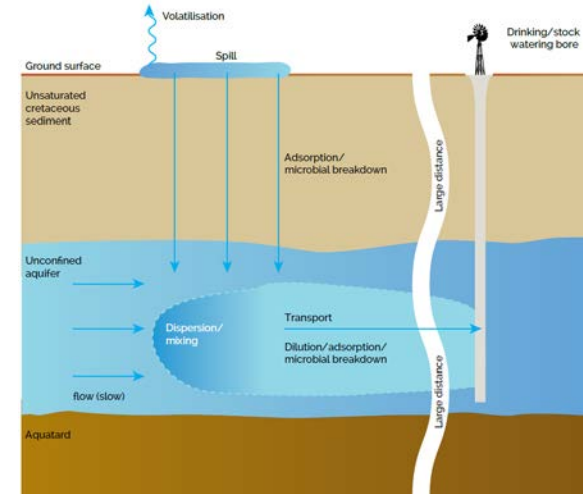
- Need better information on chemicals to be used (and those from the shale formations in gases and liquids)
- Require:
 - High construction standards (Category 9) for wells, with independent regulator certification (**Rec 7.10**)
 - Periodic integrity testing through the life of the well (**Recs 7.10, 5.3 and 5.4**)
 - Ongoing monitoring of groundwater and public reporting (**Rec 7.10**)

Risk of contamination by surface spills

- Good management of wastewater is essential
- Spills likely to occur – small volumes, rapid cleanup; unlikely to get through the soil/rock layer to the aquifer in most locations
- Key recommendations (**Rec 7.11**):
 - Enforceable wastewater and spill management plan for each well pad
 - Use of enclosed tanks to hold wastewater (not open ponds)



- Treatment of the well pad to prevent spills entering groundwater (clay or geomembrane liner) (**Rec 7.11**)
- Monitoring of groundwater with information publically available (**Rec 7.11**)
- Other recommendations:
 - No reinjection of treated or untreated wastewater (**Rec 7.13**)
 - No discharge of treated or untreated wastewater to surface waters (**Rec 7.16**)
 - Government review of wet season transport of chemicals and wastewater (**Rec 7.12**)
 - Minimise impacts of infrastructure (roads, pipelines) on flow and quality of surface waters (**Rec 7.17**)



Strategic Regional Environmental and Baseline Assessments (**SREBA**)

- There is lack of critical baseline data
- Panel concluded that there is a need for:
 - Better understanding of the Territory's unique environmental values
 - More information on groundwater and ecosystems
 - Better information on:
 - possible social impacts
 - human health
 - Aboriginal people and their culture.

- A SREBA provides the foundation for a planning framework that:
 - gives certainty to both the public and industry,
 - ensures good environmental outcomes by addressing the potential for cumulative impacts across broad regions.
- A SREBA should be completed and findings implemented prior to approval being given for commercial production
- The Beetaloo Sub-basin should be the first priority for a SREBA

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Chapter 8

Land

Land-based Risks of Onshore Shale Gas Development

The Panel assessed potential risks to:

- Biodiversity and ecosystem health
- Landscape amenity

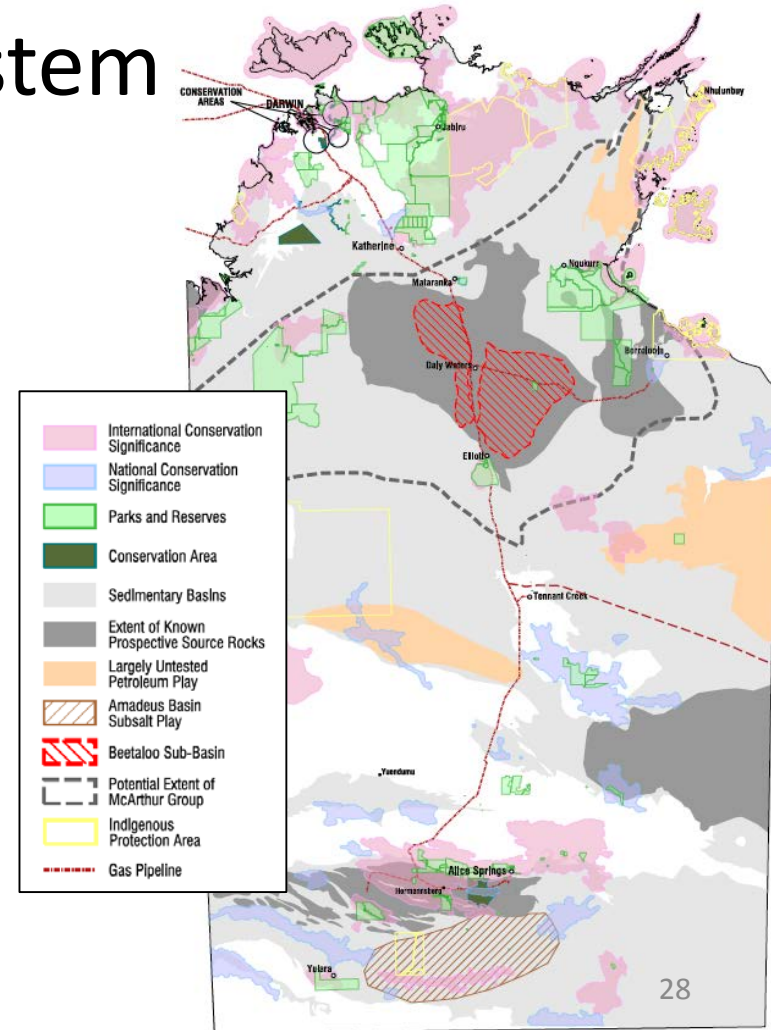
The Panel determined that the following needs to be ensured:

- no impact on terrestrial biodiversity values at regional scale
- maintenance of healthy terrestrial ecosystems
- shale gas infrastructure not highly visible
- heavy-vehicle traffic does not cause unacceptable impacts on amenity



Biodiversity and ecosystem health

- Shale gas development in areas of high conservation value considered to be unacceptable.
- The Panel considered the current conservation framework, but also knowledge gaps which should inform future conservation priorities.
- The Panel recommends:
 - National parks and other conservation areas be legislated as ‘no go’ zones (**Recs 8.1 and 14.4**)
 - Strategic regional biodiversity assessments (**SREBA**) to inform requirements for further conservation (**Rec 8.5**)



Invasive species, especially weeds

- The Panel considered the risks posed by weeds, feral animals and invasive ants. Spread mechanisms and feasibility of control were considered.
- Weeds recognised as posing highest risk
- To mitigate the impact of weeds the Panel recommended that:
 - Baseline weeds assessments before exploration (**Rec 8.2**)
 - Weed management plans (**Rec 8.3**)
 - Dedicated weed management officers and ongoing monitoring (**Recs 8.2 and 8.3**)



Changes to fire regimes

- The Panel considered how fracking might affect fire regimes and current fire management programs in the NT.
- The Panel recommended that:
 - Gas companies comply with statutory fire management plan (**Rec 8.4**)
 - Baseline fire mapping (**Rec 8.4**)
 - Control of ignitions
 - Ongoing monitoring and management (**Rec 8.4**)



Changes to native vegetation

- The Panel considered how an onshore shale gas industry could affect the structure and function of native vegetation. The Panel recommended the following measures to prevent unacceptable impacts:
 - Minimisation of vegetation clearing (**Recs 8.6** and **8.11**)
 - Avoidance of critical habitats such as rainforest and riparian zones (**Recs 8.10** and **8.12**)
 - Threatened species assessment (**Rec 8.5**)
 - Rehabilitation following operations (**Recs 8.7** and **8.11**)
 - Development and implementation of an environmental offset policy (**Rec 8.8**)



Roads and pipelines as ecological barriers

- The Panel considered how roads and pipelines could act as ecological barriers. The Panel recommended the following measures to minimise adverse impacts:
 - minimise corridor widths (**Rec 8.11**)
 - burial of pipelines (**Rec 8.11**)
 - minimise erosion and changes to water flow paths (**Recs 8.13** and **8.14**)



Landscape amenity

1. Landscape transformation

- Recommendations made to protect landscape amenity include:
 - National Parks as 'no-go' zones (**Recs 8.1** and **14.4**)
 - Well pads spaced by a minimum of 2 km and infrastructure not visible from major public roads (**Rec 8.15**)



2. Heavy vehicle traffic

- Large volumes of heavy vehicle traffic are required for hydraulic fracturing development
- Further assessment of this impact is required, but approaches to mitigate traffic impacts could include:
 - the use of railway
 - road upgrades



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Chapter 9

Greenhouse Gas Emissions

Global Greenhouse Gases

- Shale gas is methane gas
- Carbon dioxide and methane are gases that are released when gas is extracted from the earth/ground and piped to cities for use
- These gases are 'greenhouse gases', which means they contribute to climate change
- Greenhouse gases act like a blanket and warm the earth's surface
- Methane is a much worse greenhouse gas than carbon dioxide





Methane emissions

- To reduce GHGs, we want to reducing methane emissions
- We looked at how much methane escapes during ‘upstream’ extraction (when gas is being taken out of the ground) and emissions when the gas is used in cities (‘downstream’)
- The total GHG emissions are:
 - Upstream = 22%
 - Downstream = 78%
- Total emissions from NT gas industry are about 0.05% of global GHG emissions
- Upstream phase: methane can leak out of wells (during hydraulic fracturing and production) and pipes
- Leaks can be reduced by 23% if good practices, including new technologies, are used
- Need to measure the amount of methane leaks
- If there are leaks, then the gas companies need to quickly fix it



Methane recommendations

- To reduce the risk of upstream methane emissions from onshore shale gas wells in the NT the Government implement the US EPA New Source Performance Standards of 2012 and 2016 (**Rec 9.1**)
- That a code of practice and baseline monitoring of methane concentrations be undertaken for at least one year prior to the commencement of shale gas production on a production licence (**Recs 9.2 and 9.3**)
- That baseline and ongoing monitoring be the responsibility of the regulator, undertaken by an independent third party, and funded by industry (**Rec 9.4**)
- That all monitoring results should be published online on a continuous basis in real time (**Rec 9.5**)
- That once emission concentration limits are exceeded, make good provisions are implemented by industry (**Rec 9.6**)



Abandoned wells

- After production is finished, abandoned wells can leak
- Need to decommission wells (abandoned wells that have been cut-off, sealed (plugged) and then buried under soil)
- Need to improve the integrity of wells over 1,000+ years



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Chapter 10

Public Health

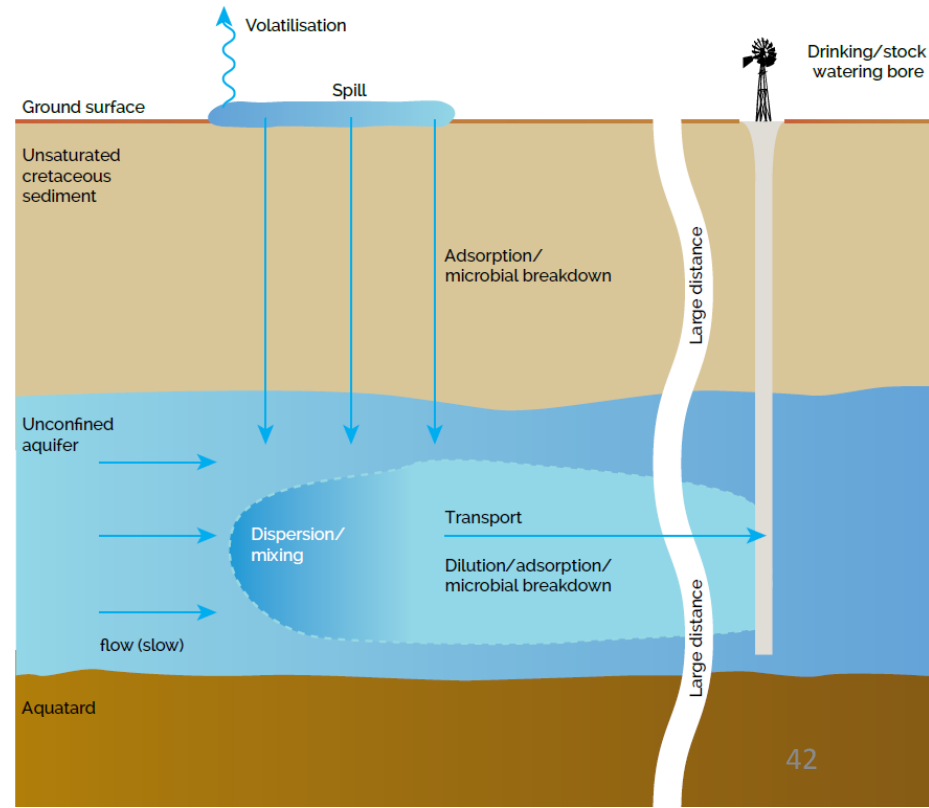


Two main approaches in draft Final Report

- Addressed potential risks posed by chemicals released from fracking fluids and flowback water by requiring formal site-specific Human Health Risk Assessments (**HHRA**) (**Rec 10.1**):
 - methods based on enHealth and NCRA guidance
 - mandate as part of EIS requirements
 - including more information on chemicals used and emitted; and treatment/disposal of flowback and produced water (**Rec 10.2**)
- Addressed risks to well-being and amenity
 - issues identified along with possible measures to mitigate risk

HHRA processes for released chemicals

- Identify chemicals of concern:
 - in HF fluids; in flowback water from deep rocks; in dusts and vapours
- Exposure pathways:
 - are people in the vicinity* likely to be exposed to contaminated water, dusts, or airborne gases and vapours
- Will these chemical exposures be harmful?
 - contrast predicted exposures with health-based guidance value



* U.S. experience and other reports (e.g. experience from CSG operations in Qld & NSW) suggest proximity to wells a significant factor in mitigating health risks

Assessed chemical risks

- HHRA reports produced so far suggest health impacts likely to be negligible with adequate controls over well integrity, fluid and chemical storage and waste disposal:
 - although reports to date have limited information on off-site risks because these pathways have been considered 'incomplete – i.e. no likely human exposures
- Off-site health risks more likely to be associated with airborne gases, vapours and dusts:
 - distance from the emission site important
 - the Panel has recommended appropriate 'set-back' distances (**Rec 10.3**)



Assessed effects on well-being and amenity

- Stress associated with negotiating land access, impacts on property values etc
- Noise, dust, other 'nuisances' and impacts of increased road traffic
- Impacts on indigenous culture and practices
- Magnitude and health impacts of these risks likely to be dependent on the scale of exploratory/production phases of any gasfields
- Strategic regional environmental and baseline assessment (**SREBA**) an important tool to assess whether gasfield developments have contributed to any increased health impacts (*Rec 15.1*)



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Chapter 11

Aboriginal People and their Culture



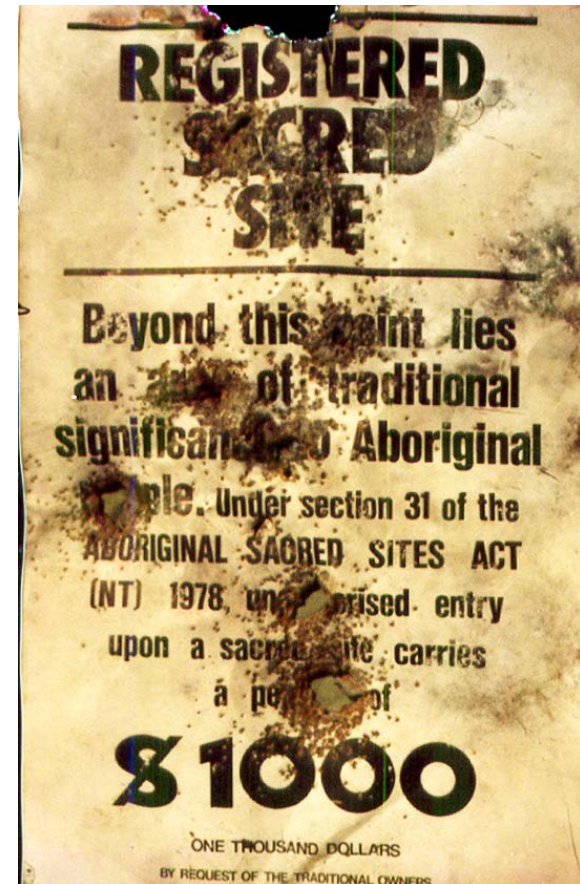
Aboriginal people and culture

- Aboriginal people live and are the traditional owners of land where the gas is
- Aboriginal people must be able to maintain their culture so that their ownership rights continue
- If the landscape suffers, so will Aboriginal people
- The potential impacts (both good and bad) of the shale gas industry on Aboriginal people and their communities must be fully explained before development starts
- A plan to manage these impacts must be put in place before development starts
- Aboriginal people must be involved in the design and implementation of this plan



The draft Final Report recommends that:

- Laws and systems to protect culturally significant places be strengthened (**Recs 11.2** and **11.3**)
- Sacred sites law to protect underground site features be amended (**Rec 11.3**)
- Gas companies be required to obtain Authority Certificates and lodge applications early in the assessment/approval process (**Rec 11.2**)
- That interpreters be used (**Rec 11.5**)



- That a comprehensive assessment of the cultural impact of any shale gas development must be completed prior to the grant of a production licence (**Rec 11.8**)
- That the Government consults and collaborates with Land Councils to ensure that reliable, accessible and accurate information about any shale gas developments is effectively communicated to Aboriginal people (**Rec 11.6**)





- That gas companies, the Government, AAPA and Land Councils must provide Aboriginal people with comprehensive information about proposed developments on all land (**Rec 11.6**)
- That gas companies, land councils and traditional owners must make exploration agreements publically available (**Rec 11.7**)



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Chapter 12

Social Impacts

We asked Coffey design a social impact assessment framework if shale gas goes ahead in the NT

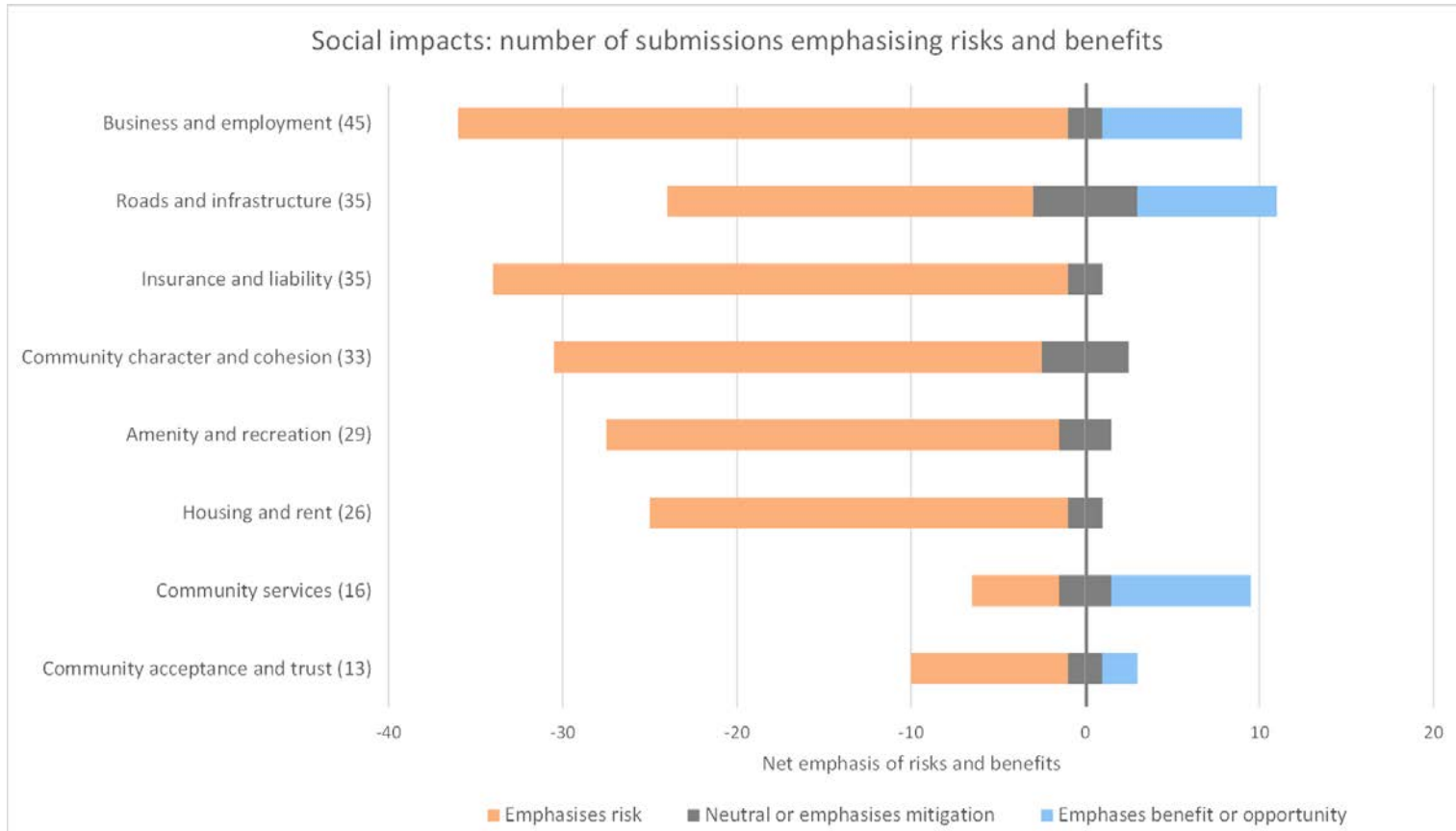
We did not ask Coffey to see if the shale gas industry already had an SLO. We asked Coffey to see if/how the shale gas industry could get one if the Government lifts the ban on fracking

Coffey did three reports:

- Social impact assessment (**SIA**) – any changes that occur from projects good and bad
- What is social licence to operate (**SLO**) – community accepting a project
- What a shale gas industry might look like in the Beetaloo Basin

The communities in the Beetaloo that were consulted told Coffey that they had lots of worries about fracking

Number of submissions emphasising risks and benefits



Why do we need an SIA?

An SIA Framework:

- Finds things that happen over time from a project
- Listens to and learns from Aboriginal communities
- Works with communities to find ways to do no harm to people and to do things better
- Finds ways to work together

Issues raised by communities consulted by Coffey

- Worried about more road accidents
- Worried about the risks to groundwater, bush tucker, country, culture
- Many people not supportive of the industry
- Many people did not trust the Government to manage this well
- Higher wages might make it difficult for local business and more expensive for people
- Money from shale gas might divide Aboriginal communities
- Many people worried about loss of culture if the gas industry gets too big and makes changes to country
- Worried that the gas industry might affect the value of land for pastoralists and agriculture

Coffey - key recommendations

- Need to assess what is happening across all projects
- Need an independent group to document what communities are like now before the industry starts
- Need to include all community and all communities in the talks
- Plans to adapt should also be done with the Government, industry and local people



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Chapter 13

Economic impacts



Possible economic impacts

- The Inquiry engaged ACIL Allen (**ACIL**) to look at the economic benefits and risks of fracking
- ACIL used its economic and financial modelling expertise to predict how much economic growth and how many jobs the gas industry might create for the NT if the ban is lifted
- ACIL had to make many assumptions (guesses) to build the model because there is not much information about the onshore shale gas and therefore any potential gas development if the ban is lifted
- Therefore, there is a lot of uncertainty in the modelling and a lot of uncertainty about the results
- We told ACIL to be very careful so as to not overstate any potential benefits about money, jobs or growth



Development scenarios

- ACIL modelled how the economy will look under five different scenarios:
 - Baseline – what the economy looks like if there is a permanent ban on fracking
 - Shale Calm – if there is exploration work only
 - Shale Breeze – if there is a small scale development (103 wells)
 - Shale Wind – if there is a medium development (167 wells)
 - Shale Gale – if there is a large scale development (670 wells – *about half the industry estimate*)
- It is not possible now to say which, if any, of these scenarios will occur

Real income

- Real income is a measure of how much money people have to buy things
- ACIL modelled the increase in real income for each of the development scenarios over 25 years:
 - Permanent moratorium – no additional income
 - Exploration only – \$35 million
 - Small development – \$937 million
 - Medium development – \$2.8 billion
 - Large development – \$5.8 billion
- These are estimates only

Jobs

- ACIL modelled how many new jobs there will be for each development scenario
- The numbers below are the estimated average number of jobs there will be in any year over a 25 year development:
 - Permanent ban – no additional jobs
 - Exploration only – 5 jobs
 - Small development – 82 jobs
 - Medium development – 252 jobs
 - Large development – 524 jobs
- These are estimates only



Population growth

- At the moment more people are leaving the NT than coming to live in the NT. This is bad for the economy
- ACIL modelled the population increase for each development scenario
- The numbers below are the average number of people there will be in the NT as the result of the shale gas industry at any time during the 25 year period:
 - Permanent ban – no more people
 - Exploration only – 10 more people
 - Small development – 195 more people
 - Medium development – 595 more people
 - Large development – 1,240 more people
- These are estimates only

Policy recommendations

- That the Government must ensure that the regions where the industry is get the benefits from any royalties received by Government so that some of the money stays in the community for better housing, roads, education and medical facilities etc (**Recs 13.1 and 13.7**)
- That early planning is important to make sure that there are job and business opportunities for local people not just FIFO jobs (**Rec 13.2 – 13.8**)
- That impacts on other industries (including other industries that use groundwater eg cattle stations and tourism) are identified early and minimised (**Rec 13.9**)



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Chapter 14

Regulatory Reform

Chapter 14 - Regulatory reform

Strong laws

- The best way to protect the environment from an onshore shale gas industry is to have strong laws
- We think that the laws in the NT are weak and are not strong enough to protect the environment, country and culture, for now and for future generations
- There are lots of ways we think that the laws can be made stronger and that the Government can make better decisions about shale gas and fracking if the Government lifts the ban on fracking

Protecting country

Gas companies should not be allowed to frack on certain land, for example (**Rec 14.4**):

- where there are sacred sites
- places with lots of important plants, animals, water and bush tucker;
- national parks
- places that are important to the community
- areas where tourists go
- areas where people live
- areas important to agriculture

The community must be given a say about which land gas companies will be allowed to frack on



Making sure the community has a say

- The Government and the gas companies must give the community reliable information so that everyone understands what is going on with gas development (**Rec 14.2** and **14.14**)
- The community should be able to have their say about whether or where fracking is allowed or not allowed (**Rec 14.2, 14.9** and **14.14**)
- The community or anyone should be able to challenge decisions that they do not like that the Government makes about gas and fracking in court ('open standing') (**Rec 14.22**)



Better Government decisions about fracking

- The Government must think about certain things when making decisions about permits, for example, protecting country (including water), protecting future generations, and listening to the views of the community ('principles of ESD') (**Rec 14.10**)
- Gas companies should only be allowed a permit if they have good environmental history (a 'fit and proper person' test) (**Rec 14.11** and **14.18**)
- The Government should look at all of the impacts of the whole shale gas industry on the whole of country (**Recs 14.9** and **14.10**)



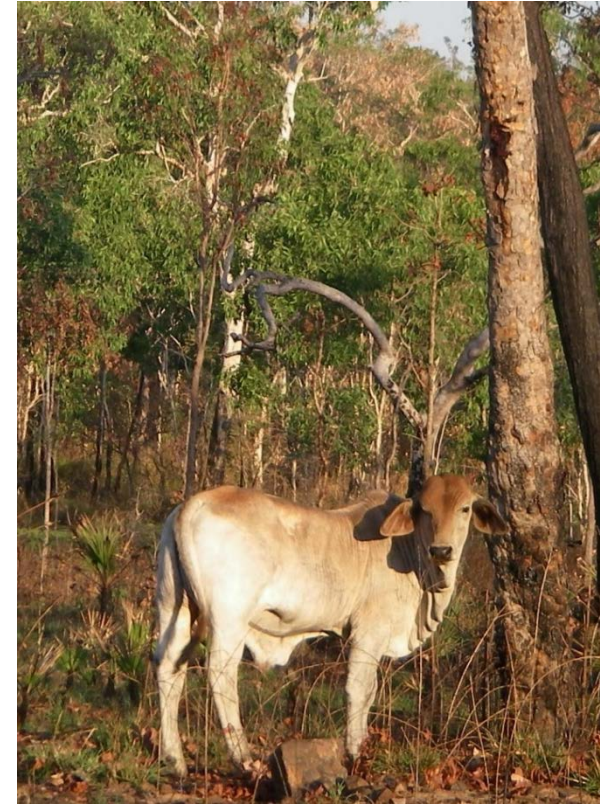
Punishment if something goes wrong

- The Government must be able to punish a gas company if it is doing the wrong thing (**Rec 14.27**). The fines must be bigger and jail for directors of companies that do the wrong thing (**Rec 14.30**)
- The Government must give the community enough information to know what the gas company can and cannot do (**Rec 14.24**)
- The community should be able to take a company to court if the company is not doing the right thing ('civil enforcement') (**Rec 14.28**)
- If there is water or land contamination, the gas companies should prove in court that they did not cause the problem (**Rec 14.29**)
- The Government must make sure that gas companies pay enough money to properly clean up and fix country if a spill or a problem happens and to look after wells and country after they have left (**Recs 14.12** and **14.13**)

Fracking for gas on pastoral land

No right of veto, but instead:

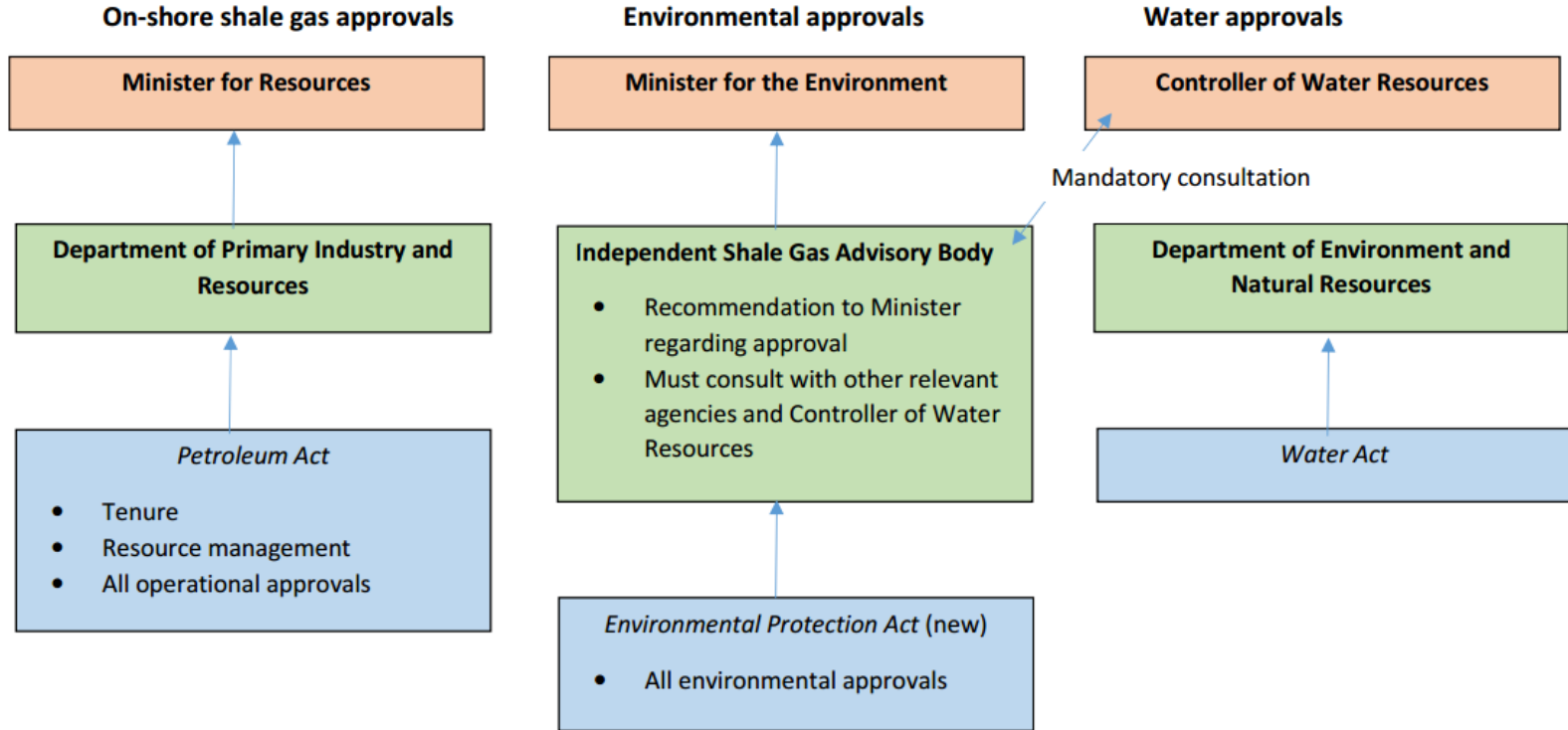
- Gas companies should get an agreement with pastoralists before they do any fracking that protects pastoralists (**Rec 14.5**)
- Pastoralists should be paid money by the gas companies for using the land (**Rec 14.7** and **14.8**)
- Gas companies should fix any damage on pastoral land they are responsible for (**Rec 14.6**)



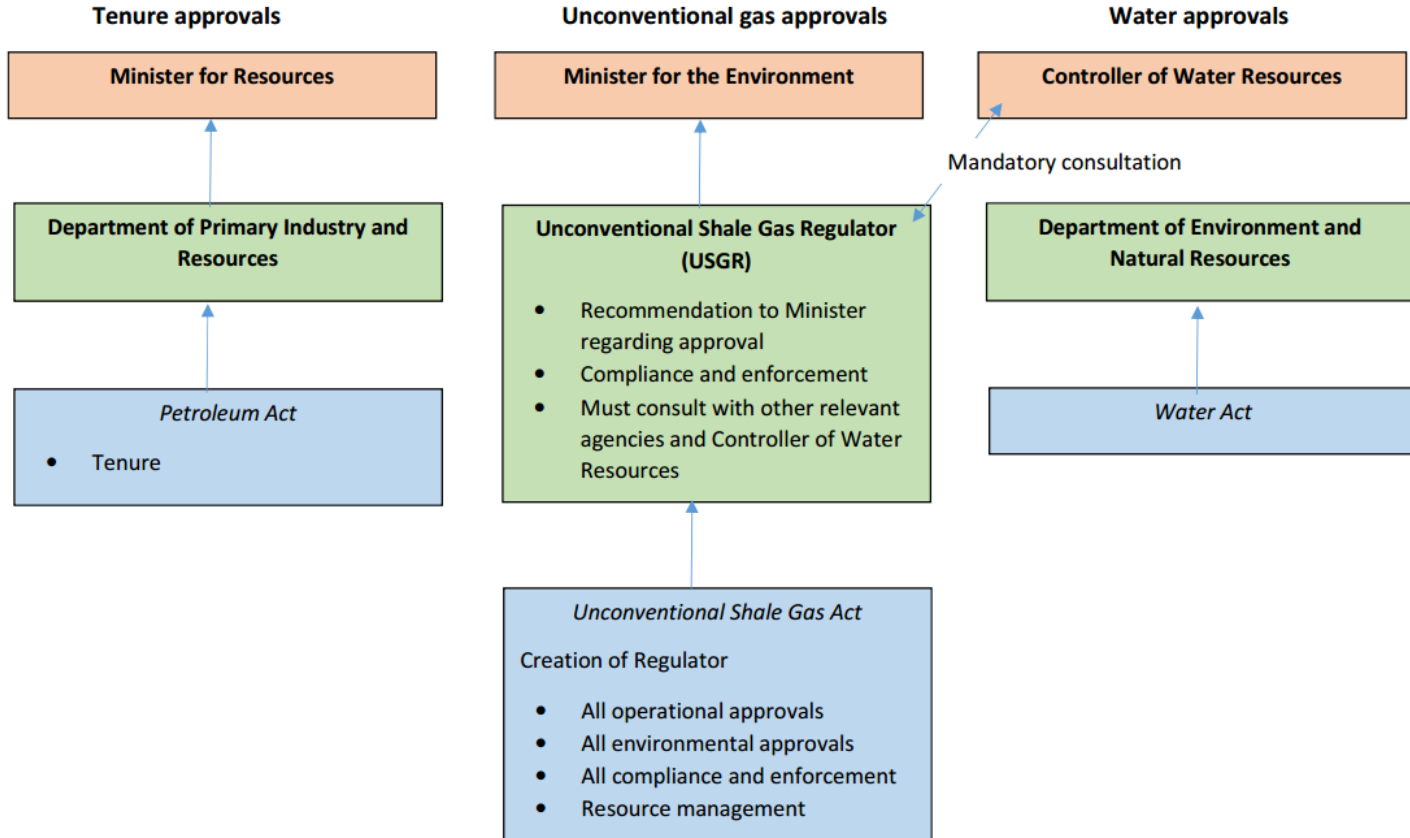
Better Government

- The Panel thinks that the way the Government deals with the gas industry must change
- The people in the Government that want the gas industry to come to the NT must be different from the people that have the job of making sure the gas industry does the right thing and follows the law and protects the environment and country (**Rec 14.31**)
- The Government must charge the gas companies money to frack so that there is enough money for the Government to check that the gas companies are doing the right thing (**Rec 14.1**)
- The Panel has come up with two ways to make the Government better and stronger when it comes to shale gas (**Rec 14.32**):
 - **Option 1:** a new separate and strong environmental approval is needed. If a gas company does not get this approval it cannot frack for shale gas
 - **Option 2:** a new independent and strong body that only deals with the onshore shale gas industry

Option 1 – a separate environmental approval



Option 2 – a new independent statutory body



Have Your Say

Anyone wishing to make a comment or provide a submission to the Inquiry is welcome to do so at any time before March 2018. So please hurry.

Post:

Post submission to:
Hydraulic Fracturing Inquiry
GPO Box 4396, Darwin
NT 0801

Email:

Send your submission to:
fracking.inquiry@nt.gov.au

Online:

Upload your submission to the
Inquiry's 'Have Your Say' page:
www.frackinginquiry.nt.gov.au