



**Appeals Convenor**  
**Environmental Protection Act 1986**

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**REPORT TO THE  
MINISTER FOR ENVIRONMENT**

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**APPEALS IN OBJECTION TO THE ENVIRONMENTAL PROTECTION  
AUTHORITY'S DECISION NOT TO ASSESS**

**LAUREL FORMATION TIGHT GAS PILOT EXPLORATION PROGRAM,  
SHIRE OF BROOME AND SHIRE OF DERBY-WEST KIMBERLEY**

**PROPONENT: Buru Energy Ltd**

Appeal Numbers 016, 018, 020, 021, 025, 026, 028, 030, 033, 034, 035, 036, 038, 039, 041,  
043, 047, 051, 053, 054, 055, 056, 057, 058, 060, 061, 062, 063, 065, 067, 069, 071, 075,  
076, 078, 080, 081, 082, 083, 086, 087, 088, 090, 091, 092, 093, 094 and 096 of 2014

**June 2014**

## Appeal summary

This report addresses appeals in objection to the decision of the Environmental Protection Authority (EPA) not to assess a proposal to undertake tests for tight gas flows using hydraulic fracture stimulation of four existing exploration wells in the Canning Basin in the Shire of Broome and the Shire of Derby-West Kimberley.

The EPA advertised its decision of 'Not Assessed – Public Advice Given' on 13 January 2014. Forty-eight valid appeals were lodged against this decision and raised six appeal grounds concerning the impact of the current proposal in the context of other similar scale proposals and future proposals to develop commercial gas production fields; risks of contamination of groundwater and surface water; water use; air, biodiversity and amenity issues; public interest and consultation; and the EPA's decision making process on the referral. The appeal investigation related primarily to whether the EPA made the correct decision not to assess the proposal in accordance with the requirements of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*.

In responding to the grounds of appeal, the EPA advised that its decision not to assess this proposal does not reflect its position on whether any future proposals will be formally assessed under the *Environmental Protection Act 1986*. The EPA advised that it would expect that results and information gathered from any small scale, 'proof of concept' proposal would be used to inform the environmental impact assessment of proposals progressing beyond 'proof of concept' to commercial scale production. The EPA advised that this would include the likely cumulative impacts from foreseeable future projects.

The EPA advised that it agreed with the Department of Water (DoW) that the risks of contamination to groundwater and surface water are minor, and that the proposal is not expected to have significant impacts on aquifers used as a water supply, public drinking water sources or wetlands.

The EPA stated that it expects consultation by the proponent with the community, including Traditional Owners, to continue so that the community has early access to adequate information to make informed comment about any proposal that the proponent plans to undertake.

### Recommendation

In considering the information presented in the appeals, as well as advice from the EPA and other government agencies, and the proponent, it is considered that the EPA was justified in forming the view this proposal does not warrant assessment and the subsequent setting of formal conditions by the Minister for Environment under Part IV of the EP Act.

In reaching this conclusion, the EPA's advice that this is a small scale, 'proof of concept' exploration proposal, of limited duration, that is unlikely to have a significant effect on the environment was noted, and that the potential impacts can be further evaluated, regulated and mitigated by the DMP and the DoW to meet the EPA's objectives for the environmental factors identified for the proposal.

It is also specifically noted that this decision relates only to the proposal as referred, and that any future commercial development by the proponent of tight shale gas will be subject to the EP Act in the normal way. In this regard, the EPA's advice that the proponent should continue consulting with the local community, including Traditional Owners, in respect to future plans for the area is supported.

It is therefore recommended that the appeals be dismissed.

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## INTRODUCTION

This report relates to appeals lodged in objection to the decision by the Environmental Protection Authority (EPA) not to assess a proposal by Buru Energy Ltd (the proponent) to carry out tests for tight gas flows using hydraulic fracture stimulation of four existing exploration wells in the Canning Basin in the Shire of Broome and the Shire of Derby-West Kimberley (the proposal). Ninety-eight appeals were received, of which 50 were not valid and are not considered further. The 48 appellants are listed in Attachment 1.

This document is the Appeals Convenor's formal report to the Minister for Environment under section 109(3) of the *Environmental Protection Act 1986* (the EP Act).

## BACKGROUND

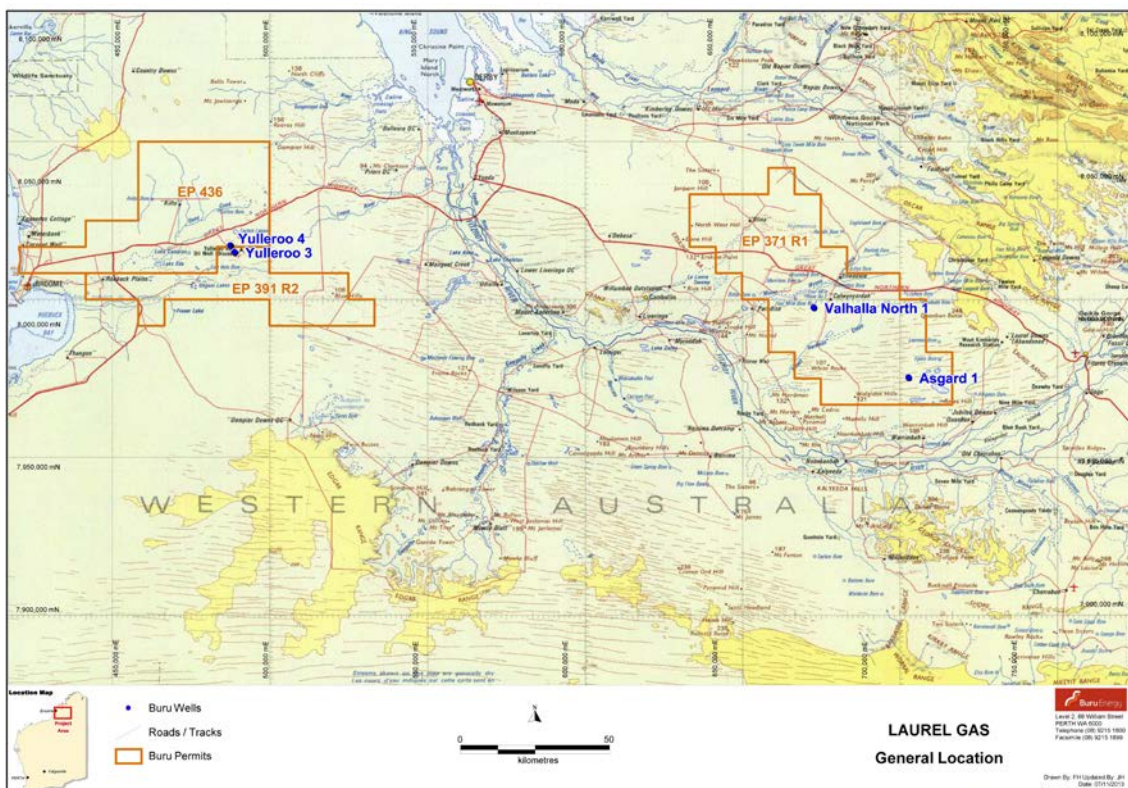
The proponent is proposing to carry out tests for tight gas flows using hydraulic fracture stimulation (hydraulic fracturing) of four existing exploration wells in the Yulleroo (Yulleroo 3 and Yulleroo 4) and the Valhalla (Valhalla North 1) and Asgard (Asgard 1) tight gas provinces in the Canning Basin. The Yulleroo 3 and Yulleroo 4 wells are located approximately 70 kilometres (km) east of Broome and the Valhalla North 1 and Asgard 1 wells approximately 270 km east of Broome. The locations of the four wells are shown in Figure 1.

The primary target for hydrocarbon exploration is the Laurel Formation where it occurs at depths below approximately 2,000 metres (m) to a foreseeable maximum of 5,000 m or more and more than 600 m below potable aquifers. The hydraulic fracturing involves the perforating of the wellbore with small holes and pressure pumping hydraulic fracturing treatment into the tight rock formation at specific target zones located between 2 km and 4 km below ground.

The proposal is of short duration, approximately three months in total.

**Figure 1 – Location of Proposal**

(source: Buru Energy Ltd 2013)



The proposal was referred to the EPA by the proponent under section 38(1) of the EP Act. The EPA received 16 public comments on the proposal, nearly all in opposition to the proposal and seeking for the level of assessment to be set at Assessment on Proponent Information (API) category B (proposal environmentally unacceptable).

The EPA considered that the environmental factors associated with the proposal are: 'Inland Waters Environmental Quality', 'Hydrological Processes' and 'Rehabilitation and Closure'. The EPA considered the proposal in accordance with the EP Act and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012* (Administrative Procedures) and determined that this small scale, 'proof of concept' exploration proposal is unlikely to have a significant effect on the environment and that it is not necessary to subject the proposal to assessment and the subsequent setting of formal conditions by the Minister for the Environment under Part IV of the EP Act. The EPA considered that the potential impacts associated with the proposal could be further evaluated, regulated and mitigated by other statutory processes to meet the EPA's objectives for the environmental factors identified for the proposal. The EPA advertised its decision of 'Not Assessed – Public Advice Given' on 13 January 2014. It was against this decision that the appeals were received.

## **OVERVIEW OF APPEAL PROCESS**

In accordance with section 106 of the EP Act, a report was obtained from the EPA in relation to the issues raised in the appeals. The proponent was also given the opportunity to address the matters raised in the appeals.

During the appeals investigation the Office of the Appeals Convenor met with the proponent and consulted with the appellants through meetings, teleconferences or e-mail. A representative of the Office of the Appeals Convenor met with representatives from the Department of Mines and Petroleum (DMP) and the Department of Water (DoW); further advice was also sought from the Department of Health (DOH).

The environmental appeals process is a merits based process. For appeals against the EPA's decision not to assess, the Appeals Convenor normally considers the environmental significance, relevance of factors, additional information not considered by the EPA, and whether other approvals processes can adequately address the relevant environmental factors without the need for formal assessment by the EPA.

## **OUTCOME SOUGHT BY APPELLANTS**

The majority of appellants requested that the proposal be remitted to the EPA for formal assessment. A number of the appellants were of the view that the proposal should not be allowed to proceed.

Some appellants suggested that a moratorium on hydraulic fracturing in Western Australia should be implemented until the Legislative Council Standing Committee on Environment and Public Affairs has completed its *'Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas'* or until there is conclusive evidence available that hydraulic fracturing is safe. Some appellants also recommended that a Health Impact Assessment should be undertaken to enable the determination of both the short-term and long-term risks to human health.

## **GROUNDINGS OF APPEAL**

Concerns raised in appeals broadly related to the following matters:

1. Cumulative impacts;
2. Groundwater and surface water;

3. Water consumption;
4. Air, biodiversity and amenity issues;
5. Public interest and consultation; and
6. Process issues.

Each of these grounds of appeal is addressed in turn.

## **GROUND 1: CUMULATIVE IMPACTS**

A key, overarching issue raised in appeals related to appellant concerns about the impact of the current proposal in the context of other similar scale proposals and future proposals to develop commercial gas production fields in the Kimberley. It was also asserted by a number of appellants that the EPA failed to apply the precautionary principle in this context.

Many appellants noted the proponent intends to develop a commercial gas production field should sufficient quantities of gas be found and contended that the impacts of such a development (including large numbers of well pads, all weather roads, pipelines, high truck movements and a range of ancillary infrastructure and facilities) on the Kimberley's environmental values and community should be assessed rather than this proposal in isolation. Some appellants also contended the EPA did not consider that the proposal is part of the State Agreement<sup>1</sup> area where drilling and hydraulic fracturing has already occurred, other exploration and production testing is being carried out by the proponent and extensive development is proposed for the future. Some appellants were concerned that, once this proposal has been concluded and the proponent decides to progress to the next stage, then it will be difficult for the EPA not to approve any future project noting the financial resources already invested in the project.

Appellants contended that the cumulative impacts of the tight gas industry as it expands across the Kimberley must be fully understood and that individual cases cannot be considered without understanding the expansive nature of the industry as evidenced elsewhere in the world. Appellants expressed concern that each stage of the proponent's development will be assessed as individual proposals and that the cumulative impacts of, for example, biodiversity loss, water abstraction, fugitive emissions and climate change, may therefore never be assessed. Some appellants were of the view that a rigorous and comprehensive cumulative bioregional impacts study, to properly quantify the nature and extent of impacts, should be undertaken prior to any tight gas development proposals in the region being considered for approval.

Some appellants submitted that the fact that the proposal is still at a 'proof of concept' phase does not preclude the option of assessing the proposal, as this would inform decision making now and provide a more comprehensive understanding of all the potential ecological, physical, social, cultural and economic impacts (including cumulative impacts) of a commercial scale project. Appellants contended that the proposal provided an important opportunity for the EPA to 'get it right' in terms of the environmental assessment, management and monitoring requirements prior to the anticipated large-scale and potentially rapid development of a gas field as has been the case overseas.

Some appellants contended that the EPA should assess this proposal with consideration of the potential cumulative environmental impacts associated with the increasing number of hydraulic fracture stimulations being undertaken in Western Australia, noting the EPA had already not assessed other 'proof of concept' hydraulic fracturing proposals in Western Australia. Appellants also contended the proposal is not a small scale proposal as considered by the EPA, noting the proposal will use 31 ML of water, involves 34 hydraulic fracture

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<sup>1</sup> In November 2012 the State Government signed the Natural Gas (Canning Basin Joint Venture) Agreement with the joint venture partners Buru energy Ltd and Mitsubishi Corporation, which was ratified under the *Natural Gas (Canning Basin Joint Venture) Agreement Act 2013*.

treatments and the injection of large volumes of chemicals through aquifers. Some appellants considered that whether the proposal is considered to be a small scale, 'proof of concept' proposal or full-scale development, the process of hydraulic fracturing is the same and the inherent risks present for each component of the operation are the same and the risks are compounded the more hydraulic fracturing stimulations are carried out.

A number of appellants identified concerns with respect to the potential implications of the proposal (and any potential commercial scale tight gas development in the future) on Australia's overall greenhouse gas emissions and their contribution to climate change. Appellants noted that the global warming potential of methane is higher than that of carbon dioxide (CO<sub>2</sub>); and referred to studies that have shown shale gas has a larger greenhouse gas footprint than coal when considering total emissions from extraction to consumption and that the use of shale gas as an energy source will result in increased global warming for decades. Appellants submitted that any assessment of greenhouse gas emissions should include consideration of the life-cycle impacts of the industry, including vented and fugitive emissions, emissions from combustion of fossil fuels used on site to extract, develop and transport the gas (e.g. diesel engines used for drilling, hydraulic fracturing and natural gas compression; flaring), as well as emissions of CO<sub>2</sub> from end-use combustion, if the implications for climate change are to be understood. Appellants submitted that the threat of climate change on Western Australia's natural environment and water resources is severe.

Some appellants also expressed concern the potential social, cultural and economic impacts associated with the rapid development of the industry have not been adequately addressed and that if the activities scale up to the extent that the resource in the Canning Basin would suggest, this could have significant long-term impacts on the communities in the area (for example through impacts on housing availability and property values, impacts on local businesses, increased levels of crime).

## Consideration

In its response to the appeals, the EPA advised that its decision not to assess this proposal does not reflect its position on whether any future proposals will be formally assessed under the EP Act. The EPA advised that it is obliged to consider any proposal as it is referred and on its individual merits and that any environmental assessment of a proposal by the EPA would consider the environmental acceptability of the proposal. The EPA also advised that, in accordance with the Administrative Procedures, it will apply the 'Significance Test' (Section 7 of the Administrative Procedures) when determining whether a proposal is likely to have a significant effect on the environment.

It is noted that, in his evidence to the Legislative Council Standing Committee on Environment and Public Affairs at the *'Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas'*<sup>2</sup>, the Chairman of the EPA (the Chairman) stated that the issue of at what point the EPA would consider the aggregate of effects of a series of small proposals that are not formally assessed, is one that the EPA frequently turns its mind to, both more broadly and specifically with respect to hydraulic fracturing. The Chairman also stated it is his and the EPA's view that it is inevitable that the EPA will formally assess a hydraulic fracturing proposal, but that will be based on the EPA's determination about whether the proposal is significant. The Chairman stated that isolating those critical issues will be important in understanding whether there are cumulative impacts and risks and how they might be managed.

With respect to the scale of proposal that would trigger formal assessment by the EPA, the Chairman stated that it is difficult to address scale, for example, to identify a specific number

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<sup>2</sup> Dr Paul Vogel. (2014). Transcript of Evidence Taken at Perth Monday, 31 March 2014. Source: [http://www.parliament.wa.gov.au/Parliament/commit.nsf/\(Evidence+Lookup+by+Com+ID\)/304A0F72E0551AF148257CC9002773F9/\\$file/ev.fra.140331.tro.001.pv.pdf](http://www.parliament.wa.gov.au/Parliament/commit.nsf/(Evidence+Lookup+by+Com+ID)/304A0F72E0551AF148257CC9002773F9/$file/ev.fra.140331.tro.001.pv.pdf) [accessed 30 April 2014].

of production wells that will trigger an assessment by the EPA, because it is related to the significance of the impact and that a number of matters (e.g. if there are large quantities of water going to be extracted from aquifers about which there is little knowledge; if there is going to be a lot of disturbance of the terrestrial environment in terms of vegetation clearance; if there is going to be flaring, etc.) will need to be taken into consideration when making a judgement about significance.

The EPA advised that it would expect that results and information gathered from any small scale, 'proof of concept' proposal would be used to inform the environmental impact assessment of proposals progressing beyond 'proof of concept' to commercial scale production. The EPA advised that this would include the likely cumulative impacts from foreseeable future projects. This is consistent with the EPA's position in Environmental Protection Bulletin No. 15 *Hydraulic Fracturing of Gas Reserves*, which states that the broader cumulative impacts to the environment and communities from associated infrastructure such as gas processing hubs, pipelines, related infrastructure together with land use changes and access also need to be considered as projects progress past trial stages.

It is noted Environmental Protection Bulletin No. 15 identifies that the potential risks and impacts associated with hydraulic fracturing and tight gas development projects are likely to include water use; storage and disposal of produced water; potential chemical contamination of groundwater and surface waters; disruption to aquifer connectivity; fugitive greenhouse gas emissions; changes to land use and associated infrastructure development and clearing of native vegetation. The EPA advised that it expects proponents to continue to collect baseline data on these risks and potential impacts, so that the information can inform any future environmental impact assessment of larger scale projects. Proponents are also expected to use the information gathered to describe how a project will develop beyond the 'proof of concept' stage, particularly with respect to water management, so that regulators and the community have a good understanding of how the industry will develop across the different parts of the State.

It is understood from discussions with the Chairman of the EPA that it is expected that the proponent will refer future proposals (in accordance with relevant requirements of the EP Act), as part of its activities in the Canning Basin and that the potential for cumulative impacts will be considered by the EPA in making its decision on whether or not to assess further proposals for drilling and hydraulic fracturing of wells in the Canning Basin.

In relation to the precautionary principle, the EPA advised that it concluded that this small scale, 'proof of concept' exploration proposal is unlikely to have a significant effect on the environment and that the precautionary principle is only applicable where there are threats of serious or irreversible damage to the environment and there is a lack of full scientific certainty.

The proponent advised that the undertaking of this exploratory proposal does not guarantee commercial production of the tight gas reservoir, but that well testing and the acquisition of baseline and operational environmental monitoring data will inform the project definition for possible future commercial development. It is understood that, in contrast to the development of conventional petroleum resources (such as the offshore gas fields off north-western Australia), where the flow rates of hydrocarbons are readily determined at the time of discovery, the development of tight gas resources such as the Laurel Formation is a staged process whereby the formation is stimulated at different depths and flowed over time to determine if commercially viable flow rates are achievable, prior to progressing to the next stage of exploration and appraisal of the resource before commercial field development. The proponent advised that regulatory approval will be required for each of the subsequent stages and it expects that an environmental impact assessment by the EPA, informed by the results of the current proposal, will be necessary prior to any proposal for commercial gas field development which would be of a significantly greater scope than the current proposal. The proponent noted that there will, therefore, be further opportunity for community and regulator



engagement in future regulatory environmental assessment processes and that the results of this pilot exploration program will also be used to inform these engagement and regulatory processes. The proponent also advised that, should consideration of cumulative impacts be relevant at a later stage in the development of the Laurel Formation, a cumulative impact assessment will be undertaken.

It is also noted that, should the results of this proposal indicate that the resource is prospective and a commercial field can be developed, the proponent believes it will nominally require 12 well pads, each less than 1,000 square metres (m<sup>2</sup>) in area when constructed and operational, to produce the 15 Petajoules (PJ) of gas over 20 years required to meet the terms of the State Agreement.

With respect to the potential impact of the proposal on greenhouse gas emissions and contribution to climate change, the EPA advised the proposal is predicted to emit 130 tonnes of CO<sub>2</sub>-equivalent over the period of the proposal and, due to the scale of the proposal, it does not consider that emissions are likely to have a significant environmental impact. The EPA also advised that it took into account that this was a small scale proposal of limited duration and that the proponent had committed to minimising the emissions of methane and other volatile organic compounds, including capture of condensate to prevent its release to the environment.

It is noted that, given the small scale and short duration of the proposal, the proponent does not consider the current proposal will impact on social amenity or lead to the social impacts identified by some appellants. The proponent advised that it has nevertheless considered social impacts associated with the proposal in the Environment Plan and has engaged with the local community and pastoralists regarding the scale of activities and associated social impacts. It is also understood that future issues surrounding social impacts will be investigated through the 'Gas Road Map' process (refer to Ground 5), including through supporting the engagement of specialist advisors to assist the Traditional Owners in scoping potential grass roots social concerns.

## **Conclusion**

Taking into account the information presented in respect to this ground of appeal, in particular noting the EPA considers any proposal as it is referred on its individual merits, that the EPA considered the proposal as a small scale, 'proof of concept' exploration proposal that is unlikely to have a significant effect on the environment and that the potential impacts can be evaluated, regulated and mitigated by the DMP and DoW, and that the decision of the EPA not to assess this proposal is consistent with Environmental Protection Bulletin No. 15 *Hydraulic Fracturing of Gas Reserves*, it is concluded the EPA was justified in forming the view the proposal does not warrant formal assessment under Part IV of the EP Act.

Specific environmental concerns about the effect of the proposal are addressed under the following grounds of appeal.

## **GROUND 2: GROUNDWATER AND SURFACE WATER**

The majority of appellants identified concerns with respect to the potential risks presented by the proposal to groundwater and surface water quality and the associated environmental and human health impacts in the event that there was contamination. Specific concerns raised by appellants include:

- Contamination of overlying shallow groundwater aquifers, including drinking water supplies and water used for agriculture and other industries in the region, through the upward migration of contaminants from the deep target formations through pre-existing faults and fractures, as well as those induced through hydraulic fracturing.

- Contamination of aquifers as a result of failure in well casings (e.g. due to corrosion, faulty construction), with a number of appellants of the view that with current engineering capabilities well integrity can never be guaranteed and thus the risks were never eliminated, regardless of whether industry best practice or standards were implemented.
- Toxicity of the chemical additives (in particular the biocide BE-9) proposed to be used in the hydraulic fracturing fluid and the potential environmental and health risks they present even at low concentrations. Specific concerns included the limited information available in the public domain because of the lack of disclosure; the value of the ecotoxicity testing undertaken by the proponent; and that there is not enough known about the chemicals and the cumulative and synergistic effects they may have in the way that they will be used in the proposal.
- Contamination of groundwater, surface water or soil as a consequence of surface spills associated with the transport, storage and handling of undiluted chemicals on site or the spillage or the leakage or over-topping of flowback fluids from surface retention ponds.
- Methane leakage and contamination of groundwater.
- Contamination of groundwater, surface water or soil with flowback water or produced fluids which are saline and contain chemicals from hydraulic fracturing fluid, naturally occurring materials found within geological formations (e.g. metals, Naturally Occurring Radioactive Materials [NORMS]/Technologically Enhanced Naturally Occurring Radioactive Materials [TENORMS], hydrocarbons) and transformation/degradation by-products that are mobilised and brought to the surface during the hydraulic fracturing process.
- The potential for increased seismic activity caused by the hydraulic fracturing process.
- Storage of flowback water and produced fluids in open evaporation ponds and the disposal of the waste material that remains after the wastewater has evaporated, with appellants generally of the view that the proposed storage of wastewater in evaporation ponds is not best practice and that the wastewater should be placed in sealed containers. Specific concerns included that the ponds will be subject to flooding given the Kimberley experiences unpredictable, extreme and prolonged rainfall events during the wet season; and the disposal of potentially contaminated material after the wastewater has evaporated.
- Re-injection of flowback water and produced fluids to the Laurel Formation.
- The potential for impacts on the Ramsar-listed Roebuck Bay and the nationally important wetlands of the Roebuck Plains; and the Fitzroy River, which is within the National Heritage-listed West Kimberley.
- The feasibility of remediation of groundwater and surface water in the case of a serious pollution incident (e.g. in the event of a well failure) and the proponent's responsibility in the event that remediation is required.
- Need for (independent) comprehensive baseline data to enable the determination of whether contamination is occurring as a result of the proposal.
- Potential for human health impacts as a result of exposure to the chemicals and proppant used in hydraulic fracturing, or the chemicals released from the geological formations or the transformation/degradation by-products and the need for monitoring to assess potential impacts on human health.
- Insufficient knowledge and information available about the hydrology/hydrogeology of the proposal area to ensure that the proposal does not adversely affect the local and regional groundwater and surface water. A number of appellants were of the view that the proponent's referral documentation lacked sufficient information to enable the EPA to adequately assess the proposal and to make an informed decision.

## Consideration

The issues raised by this ground of appeal can be regarded as relating to the following aspects of the proposal:

1. Contamination through fracturing and faults;
2. Well integrity failure and leakage;
3. Chemicals used in hydraulic fracturing;
4. Surface activities, including spills and management of flowback water; and
5. Adequacy of the proponent's referral information.

### Contamination through fracturing and faults

The EPA advised that potential risks of groundwater contamination associated with this proposal are low as the activities are occurring at depths well below any aquifers being used as a water supply and separated by between 600 m and 1,500 m of impermeable rock. This is consistent with the EPA's position in Environmental Protection Bulletin No. 15 *Hydraulic Fracturing of Gas Reserves* that a significant separation between freshwater aquifers and target gas reserves will help limit the opportunity for chemical contamination of groundwater aquifers with hydraulic fracturing fluids. The EPA also noted the proponent's contention in the referral documentation, that the impermeable nature of the overlying layers is demonstrated by the lack of hydrocarbons in aquifers closer to the surface. Over long time periods, the confining rock layer has prevented the upward migration and escape of hydrocarbons from the Laurel Formation, which is to be hydraulically fractured, into the overlying aquifers that may provide drinking water or support ecosystem function.

The proponent advised that the 600 m 'respect zone' recommended by the Royal Society (2012)<sup>3</sup> and Australian Council of Learned Academies (2013)<sup>4</sup> between the highest hydraulic fracture zone and the bottom of the closest potable aquifer, is met at all four well sites. The proponent also advised that detailed mapping and analysis of data from seismic reflection surveys, as well as information from the geological logs taken during drilling of the wells, has confirmed the absence of geomechanical hazards (e.g. significant faults that are not closed) in the well areas that have the potential for upward propagation of hydraulic fracturing fluids or hydrocarbons or likely to cause significant induced seismicity. It is also understood that the proponent has monitored baseline seismicity in the Yulleroo and Asgard/Valhalla regions for more than 18 months to confirm the area is seismically 'quiet' and to provide background sources of seismicity for comparison with seismic surveillance data that will be collected during and after hydraulic fracture operations conducted during the proposal.

With respect to concerns that hydraulic fractures could penetrate upwards from the target zone and lead to groundwater contamination, the EPA noted that the predicted fracture height for the proposal is 100 m, which is considerably less than the 600 m to 1,500 m separation zone and therefore it is unlikely that there will be fracture induced connection between the target formation and overlying aquifers. The proponent confirmed that the proposed fracture envelopes for the hydraulic fracturing treatments in this proposal have been designed to have a vertical height of approximately 100 m targeting specific rock sections and advised that there is a large commercial disincentive to allow the hydraulic fracture to extend outside the target zone. It is noted that monitoring of fracture height/length growth will be undertaken by the proponent for each stage using micro-seismic array monitoring in real time, together with pressure monitoring at the surface. The proponent also advised that, in accordance with best practice, the validation for the predicted fracture height/length growth will be accomplished using an initial Diagnostic Fracture Injection Test at the beginning of operations at each well

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<sup>3</sup> *Shale Gas Extraction in the UK: A Review of Hydraulic Fracturing*. The Royal Society and the Royal Academy of Engineering, United Kingdom.

<sup>4</sup> *Engineering Energy: Unconventional Gas Production. A Study of Shale Gas in Australia*. Australian Council of Learned Academies, Victoria.

site. It is also understood that the hydraulic fracturing stages at each well site will commence at the deepest section and sequentially move up to the shallowest target zone which will provide a further validation of fracture height/length growth realised in the formation, and that the results from each stage will be provided to the DMP on a daily basis as each stage is completed.

The EPA advised that, given the depth at which hydraulic fracturing is occurring, the proposal is not expected to impact on any groundwater dependent ecosystems, including wetlands. In relation to potential impacts on public drinking water supplies, the EPA noted that the nearest proclaimed Public Drinking Water Source Area is the Broome Water Reserve which is approximately 40 km away and draws water from an aquifer that is not hydrogeologically connected with the Laurel Formation. The DOH advised that, while it has expressed its concerns regarding the exploration and exploitation of unconventional gas reserves that are located in close proximity to existing and potential Public Drinking Water Sources, it has no objection to this proposal. The DOH noted that the four wells are not located near any known or potential drinking water sources, nor have any potential to affect any known or potential drinking water sources that could be located downstream of any proposal activities.

The proponent noted there have been no confirmed reports of contamination from groundwater due to hydraulic fracturing and referred to the Australian Council of Learned Academies (2013) study which found there have been no cases internationally where hydraulic fracturing associated with the extraction of shale and tight gas had accidentally intersected a water source and caused contamination.

It is understood that the proponent has implemented environmental baseline and surveillance monitoring programs to monitor seismicity, groundwater, ground gases and air emissions during the proposal. The proponent advised that the monitoring programs have been developed with the advice from specialists in seismicity, groundwater and air quality; and that it has consulted with the relevant regulatory agencies, including the DoW, the DOH, the Department of Environment Regulation (DER), the Water Corporation and the DMP regarding the proposed monitoring programs, as well as with the independent specialist advisory groups established for the Traditional Owners (refer to Ground 5). In addition, it is understood the proponent's Environmental Surveillance Sampling and Analysis Plan has been consulted on through the inter-agency science working group coordinated by the DMP (refer to Ground 6) and has been independently peer reviewed by Professor Neil Coles<sup>5</sup> and Professor Peter Styles<sup>6</sup>.

With respect to groundwater monitoring specifically, it is understood that monitoring will include the continuous monitoring of groundwater level, methane, ethane and propane in groundwater prior to, during and after the conclusion of the proposal. It is also understood that the proponent has undertaken characterisation of baseline groundwater chemistry at each of the sites over two wet seasons and two end-of-dry seasons and that, prior to the commencement of the proposal, environmental monitoring bores will be installed upstream and downstream of each well site.

The DMP advised that under the *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012* (Petroleum Environment Regulations), all emissions and discharges (including to land, air, groundwater, sub-surface or inland waters) must be monitored and submitted to the DMP on a quarterly basis throughout the life of the activity, with the reporting period commencing the date the Environment Plan is approved.

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<sup>5</sup> Director for the Western Australian Centre for Excellence for Ecohydrology at the University of Western Australia.

<sup>6</sup> Professor of Applied and Environmental Geophysics, Applied and Environmental Geophysics Research Group, School of Physical and Geographical Sciences, Keele University, United Kingdom. Professor Styles provided expert advice to the Royal Society review of hydraulic fracturing in the United Kingdom.

### Well integrity failure and leakage

The EPA advised it noted the measures taken by the proponent and the expert advice from the DMP in regards to well integrity when forming the view that the integrity of the wells did not pose a significant risk that required the proposal to be formally assessed by the EPA. The EPA also noted the advice of the DMP that it will not approve hydraulic fracture stimulation activities on wells that do not pass integrity tests and that the proponent is required to report daily on the results of well integrity checks and include mitigation and contingency measures in the Environment Plan.

It is noted that the DMP advised the EPA that information on the current state of well integrity of the four wells will be provided to the DMP in a Well Stimulation Program which will be assessed by the Petroleum Resource Branch and must detail all integrity checks to be undertaken on the wells prior to the commencement of activities. The DMP advised that before any stimulation operations can commence, the integrity of the steel casings of the wells will need to be confirmed through pressure testing. The DMP also advised that the monitoring of sub-surface operations during hydraulic fracture stimulation will be detailed in the Well Stimulation Program for the proposal as required in the Schedule of Onshore Petroleum Exploration and Production Requirements 1991 (Onshore Schedule).

It is noted the proponent has implemented a number of measures with respect to well integrity, including:

- Best practice management using a life-cycle well management system approach from exploration to site selection through construction and operation to plug and abandonment and remediation using As Low As Reasonably Practicable (ALARP) risk management principles.
- The four wells to be completed during the proposal are existing Company wells that were constructed between 2011 and 2013 in accordance with the Onshore Schedule, as well as international standards (American Petroleum Institute) for well design, and all well designs were assessed and approved by the DMP.
- The design of well integrity includes four protective steel casing strings to provide a strong vertical structure and ensure well integrity; including an Intermediate casing string which provides additional protection against the risk of surface contamination.
- Ongoing routine maintenance includes testing of the annulus pressure (casing head pressure) using a pressure gauge at surface between the Intermediate casing and the Production casing, with the objective to identify any anomalous pressure readings in this key annulus to ensure ongoing safety and integrity of the cement bond and to confirm the continued isolation of sub-surface pressured formations.
- A review of the integrity of the four wells has been undertaken and independently reviewed by an international specialist, which confirmed that the proponent's findings for the well integrity assessment and the proposed management measures to ensure operational risks are managed to As Low As Reasonably Practicable (ALARP) during the implementation of the proposal are robust. As part of the well integrity assessment and assurance program for the proposal, additional tests (Cement Bond Logs, pressure tests) on each of the wells were undertaken.

The EPA noted DMP advice that onshore petroleum wells must be plugged in accordance with the Onshore Schedule, which mitigates the potential for well integrity failure post-closure. The DMP also advised the EPA that the well plugging and abandonment procedures required in Western Australia are world's best practice.

With regard to concerns identified by appellants about the number of wells that have been reported in overseas studies to have compromised structural integrity, it is noted that in further information provided to the Legislative Council Standing Committee on Environment and Public Affairs at the 'Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas', the DMP advised<sup>7</sup>:

...Individual casing failure rates and well failure rates vary widely with the type of well, geographical location, maintenance culture of the operator, as well as the regulatory regime in place in the respective jurisdiction. Failure rates of well casing and well integrity failures, measured on wells constructed in a specific time period, are artefacts of that era; they are not identical to failure rates of wells designed and completed later. Wide ranging studies in the onshore US and Canada for oil, gas and injection wells indicate an overall leak frequency (well failure) ranging from 0.005 to 0.03% of wells in service at this time (Kell 2012, Texas Groundwater Protection Council Data 1997 to 2011); however, areas with older wells and surface facilities tend to have higher leak frequencies.

The advice of the proponent that the extraction of fluid (e.g. gas and oil) at formation level via flowback up the well over time creates negative pressure gradients in the formation which will oppose any upward hydraulic gradient is also noted. This means that as a well produces over time, the pressure inside the wellbore is lower than outside the well and the fluid will move from the formation towards the well and thus any potentially occurring leak path is into the well and pollution potential is absent.

#### Chemicals used in hydraulic fracturing

The EPA advised that it is of the view that it is unlikely that there would be any significant impacts to groundwater or surface water from chemicals to be used in the proposal. The EPA noted that as part of the DMP's regulation of hydraulic fracturing chemicals, petroleum companies must demonstrate in their Environment Plan that the use of chemicals selected does not pose an unacceptable risk to human health, the environment or groundwater resources.

The EPA advised that new regulations were gazetted under Western Australian petroleum legislation in August 2012 that require disclosure of chemicals used in hydraulic fracturing and increased reporting requirements. The EPA noted that the chemicals being used will be required to be disclosed in accordance with the DMP's *Chemical Disclosure Guideline* and this information will be publicly available on the DMP's website. The EPA advised that, according to the DMP, Western Australia now has the greatest level of chemical disclosure of any jurisdiction in Australia.

With respect to the down-hole use of chemicals, the DMP advised:

Chemicals used downhole for drilling or injection are required to be fully disclosed to DMP. The standards for disclosure are set out in the DMP's Chemical Disclosure Guidelines; however maximum levels of chemicals are not specified within the guidelines as this is assessed and determined on a case-by-case basis.

Operators must provide detailed information to demonstrate that risks from these chemicals can be managed to ALARP. This information includes chemical composition, ingredients, chemical and physical properties of the products/additives, toxicity and ecotoxicity, maximum concentration of chemicals and Material Safety Data Sheets for verification.

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<sup>7</sup> Department of Mines and Petroleum. (2014). Corrected Hansard and Responses to DMP Questions on Notice: Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas Hearing of February 2014. Source: [http://www.parliament.wa.gov.au/Parliament/commit.nsf/\(Evidence+Lookup+by+Com+ID\)/AB633504F1C99A9D48257C9B001DED02?opendocument](http://www.parliament.wa.gov.au/Parliament/commit.nsf/(Evidence+Lookup+by+Com+ID)/AB633504F1C99A9D48257C9B001DED02?opendocument) [accessed 24 April 2014].

The EPA noted that the independent chemical risk assessment of the chemicals in the down-hole fluid system for the proposal commissioned by the proponent in accordance with the DMP's *Environmental Risk Assessment of Chemicals Used in WA Petroleum Activities Guideline* found that the hydraulic fracturing fluid is classified as non-toxic under national guidelines and the constituent chemicals in the fluid have low persistence and readily biodegrade. It is noted the *TGS14 Environmental Risk Assessment of "Down-Hole" Chemicals* (Ecosus Pty Ltd 2014)<sup>8</sup> concluded:

The chemicals selected for the [hydraulic fracturing] fluid system are an environmentally friendly suite largely also used from the food industry. This detailed environmental risk assessment has determined that none of the chemicals to be used are classified as carcinogens or teratogens, are not persistent in the environment and do not bioaccumulate.

With respect to the biocide BE-9, the proponent advised that BE-9 is registered for use in Australia under the National Industrial Chemicals Notification and Assessment Scheme (NICNAS). It is also noted the *TGS14 Environmental Risk Assessment of "Down-Hole" Chemicals* concluded that at comingled concentrations of 0.2 parts per million (ppm) of biocide, the risk of environmental impact is considered minimal.

The EPA advised that its view is that the DMP can adequately regulate the potential impacts to human health under existing legislation.

#### Surface activities

The EPA advised it considered the potential for impacts to the quality of groundwater and surface water from surface activities (e.g. storage and use of chemicals, water storage ponds, etc.) in determining not to assess the proposal. The EPA noted advice from the DoW that there was a minor contamination risk from surface-based activities associated with the proposal, but that best management practices were proposed to be implemented by the proponent (e.g. chemical storage and use, the use of liners in water storage ponds and bores to monitor seepage).

The EPA also noted the proponent has undertaken a source-pathway-receptor assessment to inform management and mitigation measures, which include:

- The storage of hazardous materials within impermeable bunds and procedures to handle hazardous materials;
- Requirements under the *Dangerous Goods Safety Act 2004* to ensure safe storage, handling and transport of dangerous goods;
- Waste monitoring;
- Isolating all recovered fracturing fluids in lined water retention reservoir designed to prevent leakage, as required by *APPEA Code of Practice for Hydraulic Fracturing (2011) Guideline 5*; and
- Treatment of flowback water if required, to remove solids, then disposal of solids at an approved facility.

It is noted the DMP regulates the re-use or disposal of wastewater from hydraulic fracturing through the Petroleum Environment Regulations in the first instance, with referral to the DoW and/or the DER where there is potential to contaminate water resources. The DMP requires that the impacts of waste disposal are risk assessed and that the methods of waste disposal are selected to ensure risks are managed to As Low As Reasonably Practicable (ALARP).

It is understood that the retention ponds for the proposal will have raised earthen embankments and will be triple-lined, with liners secured to the crown of the embankment

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<sup>8</sup> Ecosus Pty Ltd. (2014). *TGS14 Environmental Risk Assessment of "Down-hole" Chemicals*. Report prepared for Buru Energy Ltd by Ecosus Pty Ltd (J1312\_Buru\_TGS14\_ERAC\_3, dated 19 March 2014).

which is 1.5 m above the surrounding well pad elevation/ground level. It is also understood a minimum of 1.5 m of freeboard will be maintained in the retention ponds when the flowback period is complete, which is approximately double the annual regional rainfall and exceeds the minimum 1:20 year rain event recommended in DoW's Water Quality Protection Note No. 39 *Ponds for Stabilising Organic Matter*. The proponent advised, based on the predicted flowback water quality, the design of the retention ponds for the proposal exceeds the recommended specifications for wastewater ponds in Water Quality Protection Note No. 39.

It is understood the proponent considered the use of tanks/bladders for the storage, but that these are susceptible to damage on site and during transport, and would require major trucking movements to transport flowback water large distances for off-site disposal. The proponent advised that transport represents one of the highest environmental risk events.

The proponent confirmed that a spill response plan specific for the proposal has been prepared and is included in the Operational Plan for the proposal. It is understood the plan includes measures for chemical spill response.

In relation to concerns about the flowback water quality, the proponent confirmed that it is intending to characterise the flowback water on a daily/regular basis during the flowback period. The proponent also advised that, following the completion of re-injection, residual sediment comprising an estimated 1–2% of total volume will remain in the retention ponds for alternate disposal and that this material will be characterised before off-site disposal.

It is noted that, based on the proponent's information from the chemical analysis of flowback water from hydraulic fracturing of the Yulleroo 2 well, as well as analysis of drill cuttings and leachate, produced water and baseline water quality sampling, the flowback during the proposal is expected to have the following water quality attributes:

- Very low or non-detectable levels of heavy metals that are of concern in urban industrial wastewater (e.g. chromium, copper, nickel, zinc, cadmium, lead, arsenic, mercury);
- Radiation levels below (<20%) the guideline trigger values for drinking water and below the baseline radiation levels in the potable Broome Sandstone Aquifer;
- Elevated levels of salt (sodium chloride), approximately six times the level of seawater;
- High levels of calcium; and
- Metals such as iron, calcium, magnesium and boron at levels that are within known ranges for normal produced waters.

With respect to concerns about the occurrence of benzene, toluene, ethylbenzene and xylenes (BTEX), the proponent advised that no BTEX additive products will be used in the hydraulic fracturing fluid but that the flowback water will contain hydrocarbons, including naturally occurring BTEX. The proponent also advised that petroleum/BTEX concentrations in the flowback at the well head is unknown at this stage, noting that the characterisation and measurement of this is the commercial objective of the flowback studies. The proponent advised that the flowback is passed through a three-phase separator to capture and remove petroleum and gas from the flowback before it is passed to the retention pond.

In relation to concerns about the risk of induced seismic activity associated with the re-injection of flowback water, the proponent's advice that the increased seismic risks posed by re-injection of wastewater relate to wastewater re-injection at an industrial scale and volumes of water orders of magnitude higher (tens of gigalitres per year) than the volumes of water proposed to be re-injected in this proposal, is noted.

With respect to concerns regarding emissions (including discharge of contaminated wastewater from retention ponds; disposal of waste, including radioactive waste) that are managed through licences and works approvals required under Part V of the EP Act, the EPA



advised that the proponent indicated in the referral documentation that, due to the scale of the proposal, it will not exceed the 5,000 tonnes capacity threshold for production of oil and gas from wells to be considered a prescribed premise for the purposes of Part V of the EP Act and as such would not require works approvals or licences under the EP Act.

It is also noted that the general provisions of the EP Act specifically prohibiting pollution and serious environmental harm will apply to the proposal and that a person who causes pollution or allows pollution to occur commits an offence. The proposal will also be subject to the requirements of subsidiary legislation such as the *Environmental Protection (Controlled Waste) Regulations 2004* and the *Environmental Protection (Unauthorised Discharges) Regulations 2004*. In addition, the *Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009)* (Department of Environment and Conservation 2009) will be required to be applied by the proponent in determining the classification of wastes for acceptance to landfills licenced or registered in Western Australia in accordance with Part V of the EP Act.

The EPA advised that, in making its recommendation of 'Not Assessed', it agreed with the DoW that the risks of contamination to groundwater and surface water are minor, and that the proposal is not expected to have significant impacts on aquifers used as a water supply, public drinking water sources or wetlands. The EPA also advised that, having considered expert advice from the DoW and the DMP, it formed the view that any risks of groundwater contamination associated with this relatively small scale exploration proposal can be adequately regulated and mitigated by the DMP to ensure that any impacts to the environment are not significant. The EPA advised that it recommended in its Public Advice for the proposal that, prior to approval, the DMP should consult with the DoW as to requirements for water quality monitoring and that the DMP should impose conditions of approval requiring the proponent to carry out such monitoring and to carry out remediation in the event of spillage or contamination.

It is noted that Professor Coles concluded in his review of the uses and risks to local water resources in the Canning Basin associated with the proposal operations<sup>9</sup>:

The evidence and documentation provided by Buru Energy demonstrates that the operations satisfy the Significance Test (DMP, 2013) and comply with internationally recognised operational standards and fall within the criteria defined so as to manage the associated risks to As Low As Reasonably Practicable (ALARP).

Based on the evaluation of the available literature and company operational guidelines, it is concluded that the proposed operational testing of Hydraulic Fracturing in the Yulleroo and Valhalla & Asgard areas presents a demonstrably low risk to the water resources in this region.

#### Adequacy of the proponent's referral information

It is noted that the proponent has undertaken a number of technical studies, including hydrogeological assessment, geological environment risk assessment, chemical risk assessment and a review of well operation and integrity, to characterise the environment and the proposal activities and to support and inform the environmental risk assessment undertaken for Environment Plan for the proposal. The proponent advised it engaged independent specialist reviewers in the areas of water resources (Professor Coles) and geological environment (Professor Styles) to ensure that the technical studies were based on robust science and that the conclusions drawn in the environmental risk assessment were consistent with best practice.

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<sup>9</sup> Coles, N.A. (2013). *Preliminary Water Resources Evaluation Report*. Report prepared for Buru Energy Ltd, Report Number CFE 05/2013.

It is understood that this information has been submitted with the Environment Plan for the proposal which will be assessed by the DMP. It is also understood that the DoW has provided advice to the DMP with respect to the Environment Plan on issues that have the potential to impact water resources. It is noted that, as set out in the DMP's *Guidelines for the Preparation and Submission of an Environment Plan Under the Environment Regulations*, the DMP may request further information in the event it considers an Environment Plan is not acceptable due to operational or technical issues associated with the proposed activity and/or the nature of the Environment Plan.

## Conclusion

Taking into account the information presented in respect to this ground of appeal, it is concluded that while there may be a minor risk of contamination of groundwater and surface water arising from the proposal, the concerns raised in respect to groundwater and surface water are issues that can be considered by the DMP through its assessment of the Environment Plan required under the Petroleum Environment Regulations and that it is open to the DMP not to approve the Environment Plan if it does not adequately meet all of the requirements of the Petroleum Environment Regulations. It is also noted that the DMP is consulting with relevant agencies about the adequacy of the proposed management measures and monitoring programs.

With respect to Environment Plans required under the Petroleum Environment Regulations, the DMP advised:

The [Petroleum Environment] Regulations provide for a risk-based management approach through Environment Plans rather than the prescription of conditions on activities.

The intent of the [Environment Plan] regime is to ensure that the [Environment Plan] functions as a regulatory approval document and as a practical implementation and management tool to be used by the operators and their contractors when conducting the activity.

Once accepted, the [Environment Plan] becomes the legally binding agreement between the Department and the operator, setting out environmental performance objectives, standards and criteria which the operator will be assessed against. An [Environment Plan] must have undergone formal assessment and been approved by the Department before being implemented.

While regulation 11(4)(b) provides DMP the capacity to approve an Environment Plan subject to the imposition of limitations or conditions applying to the activity, an over-riding consideration in the assessment of an [Environment Plan] is that if the plan does not adequately meet all of the requirements of the regulations it will not be approved. Therefore where an [Environment Plan] is not approved, DMP will request revisions of the [Environment Plan] until an acceptable plan is received from the operator in preference to applying conditions.

Operators must demonstrate within the [Environment Plan] that the environmental impacts and environmental risks of the activity will continuously be reduced to as low as is reasonably practicable (ALARP). This is done through the inclusion of commitments within the Environment Plan which act as self-imposed conditions operators must achieve. This ensures that all aspects of the Environment Plan are covered under the ALARP process.

The EPA's decision not to assess the proposal, noting among other things the presence of other statutory processes which the EPA says meets its objectives for the environmental factors identified for the proposal, is considered to be consistent with the Administrative Procedures. It is therefore concluded the EPA was justified in forming the view the proposal does not warrant formal assessment under Part IV of the EP Act with respect to potential impacts to groundwater and surface water quality.

### **GROUND 3: WATER CONSUMPTION**

A number of appellants identified concerns about the additional pressure on surface water and groundwater supplies from the abstraction of the large amounts of water (31 million litres per well) the proposal would require during the hydraulic fracturing process. Appellants noted that water supply is at a premium in north-western Australia, and will be increasingly so in the future as a consequence of climate change, and is relied on for drinking water, agriculture and other non-mining uses, as well as the sustainability of the natural environment.

#### **Consideration**

The EPA advised that it is of the view that it is unlikely that the proposed volume of groundwater abstraction would result in a significant impact on the environment or on other groundwater users. The EPA noted that the proponent has existing water licences for the proposal and that the DoW can regulate abstraction in accordance with licences granted under the *Rights in Water and Irrigation Act 1914* (the RIWI Act). It is noted that the DoW gives consideration to both the short and long-term economic, environmental and social impacts of granting and/or refusing licences as outlined in the RIWI Act. It is also understood that water licences contain a set of terms and conditions detailing the licensee's responsibilities and specifying the volume of water that may be taken in any given year and a licence may include requirements to monitor, manage and regularly report on any impacts the taking and using of water may have on water resources, the environment and other water users.

The proponent confirmed that it has been granted two licences by the DoW to take and use the water necessary to undertake the proposal. Each licence allows the proponent to take, cumulatively, up to 100 ML of locally sourced water in 2014 which includes contingencies for drilling, road maintenance, fire protection, camp operations, as well as requirements for hydraulic fracturing operations. It is noted that the proponent has estimated that the maximum quantity of groundwater to be extracted from the sub-catchment of the Broome Sandstone Aquifer in which the Yulleroo wells are situated, for all proposal operations in the Yulleroo area, corresponds to 1.6% of the conservative recharge estimate for this portion of the aquifer, which the proponent considers is a small fraction of the likely annual sustainable yield for this portion of the Broome Sandstone Aquifer.

It is noted that one of the stated objectives of the proposal is to demonstrate that flowback water from hydraulic fracturing can be 100% recycled, using it safely in hydraulic fracture treatments while minimising the amount of water required to be abstracted from the aquifers. It is also understood that the proponent will monitor and record the volumes of water taken and that this information will be reported in the proponent's Annual Environment Report.

#### **Conclusion**

Taking into account the information presented in respect to this ground of appeal, it is considered that the concerns raised in relation to water consumption are matters that the DoW can take into consideration through the issuing of licences under the RIWI Act.

The EPA's decision not to assess the proposal, noting among other things the presence of other statutory processes which the EPA says meets its objectives for the environmental factors identified for the proposal, is considered to be consistent with the Administrative Procedures. It is therefore concluded the EPA was justified in forming the view the proposal does not warrant formal assessment under Part IV of the EP Act with respect to potential impacts on water resources.

## **GROUND 4: AIR, BIODIVERSITY AND AMENITY IMPACTS**

Appellants expressed concerns with respect to potential impacts of flaring and venting, evaporation from surface retention ponds, fugitive emissions (e.g. from flowback of hydraulic fracturing fluid and from well heads, condensate tanks) and emissions from diesel engines, on air quality and the implications for the natural environment and public health. Appellants emphasised the need for (independent) comprehensive baseline data to determine if contamination is occurring as a result of the proposal and some submitted that monitoring should be also undertaken to assess the potential impacts on human health.

Some appellants expressed concern that the proposal will not be licensed under Part V of the EP Act and were of the view that the DMP regulatory arrangements do not include standards and monitoring requirements for air pollution. Some appellants also questioned the adequacy of the proponent's referral information, noting, for example, the absence of modelling or analysis to demonstrate that air quality standards will be met.

Appellants also identified concerns with respect to increased heavy vehicle traffic and associated impacts on roads and safety; impacts associated with increased human activity in the areas surrounding the well pads; impacts on visual amenity; and the impacts of clearing of vegetation. Some appellants submitted that the noise and light produced by the activity (including flaring) has the potential to affect both the wildlife and human populations in the areas near the well pads.

### **Consideration**

It is noted that the EPA did not consider 'Air Quality', 'Flora and Vegetation', 'Terrestrial Fauna' or 'Amenity' to be preliminary environmental factors for this proposal.

With respect to air quality, the EPA advised that it took into account that this was a small scale proposal of limited duration and that the proponent had committed to minimising the emissions of methane and other volatile organic compounds, including capture of condensate to prevent its release to the environment.

The proponent advised that air emissions were considered during the environmental risk assessment and the preparation of the Environment Plan. The proponent confirmed that all wells will be flowed using reduced emissions completions. It is noted that reduced emissions completions (also known as 'green completions') have become a key technology to recover the gas during flowback and limit the amounts of methane, volatile organic compounds and hazardous air pollutants that can be vented during the flowback period and can eliminate or significantly reduce the need for flaring. The proponent advised that venting of gas to the atmosphere will be avoided and when this is not possible for safety or operational reasons, it will be kept to a minimum. The proponent also advised that earthen pits will not be used during flaring; from the well head, all condensate will pass to the separator and gas will pass to a 14 m vertical flare stack. It is understood that flaring is regulated by the DMP, including consideration of safety, environmental and technical aspects when designing and operating flare stacks.

The proponent advised that it considers that the potential impact on air quality from hydraulic fracturing operations and subsequent flowback and flaring associated with this proposal, is likely to be small and of short duration and consist predominantly of diesel fumes and CO<sub>2</sub> from methane combustion. It is understood that an air quality monitoring program will be implemented at the Yulleroo 4 and Asgard 1 well sites during hydraulic fracturing and the flowback period to confirm that emissions do not result in exposure levels that pose a risk to human health. It is also understood that the proponent referred the proposed air quality monitoring program to the DOH for advice and comment. The EPA also noted that the proponent will undertake air quality monitoring and advised that it expects that the data from

this monitoring will be used to predict the likely impacts on air quality from any larger scale proposals.

With respect to concerns about increased traffic movements, the proponent advised this will be limited to approximately 60 truck/vehicle movements when mobilising to each of the well sites over an approximately four day period, which it considers is minor in comparison to pastoral and other users of the road. It is noted the proponent considered the impact of increased traffic on amenity in the Environment Plan and that the proponent has consulted with Main Roads WA regarding the increased traffic movement associated with the proposal. It is understood Main Roads WA considered the increased traffic as a result of the proposal to be insignificant given the scale and duration of traffic associated with the proposal. The proponent also advised that vehicle movements will be restricted to daylight hours in accordance with the Environment Plan, which will minimise impacts on fauna.

It is understood the proposal will occur on pre-existing well sites and that no clearing of vegetation will be required. The proponent advised that prior to clearing of the well sites, flora and fauna surveys were undertaken, as required under the *Petroleum and Geothermal Energy Resources Act 1967* and associated regulations.

With regards to noise, the EPA noted from the proponent's referral documentation that hydraulic fracture treatment operations will be confined to daytime operations and will be short duration of approximately one week, while loud (90 decibels [dB] close to source) operations (i.e. pumping) will be for approximately one day. The EPA advised that flowback operations (i.e. separator and gas flare) will have low noise levels which will be barely audible beyond the well site. It is also noted the proposal must comply with the *Environmental Protection (Noise) Regulations 1997*.

It is noted the proposal will be implemented at remote locations on pastoral stations many kilometres from the nearest settlement, transport or communications infrastructure, with the nearest homesteads or communities to the well sites located more than 20 km away and the nearest town located more than 50 km away. The proponent advised the noise and light from the proposal will barely be able to be heard or seen beyond the boundary of the well pad. It is understood the potential impacts of noise and light on wildlife near the well pad have been considered in the Environment Plan.

## **Conclusion**

Taking into account the information presented in respect to this ground of appeal, it is considered that the concerns raised are matters that the DMP can take into consideration through its assessment of the Environment Plan required under the Petroleum Environment Regulations and that it is open to the DMP not to approve the Environment Plan if it does not adequately meet all of the requirements of the Petroleum Environment Regulations.

The EPA's decision not to assess the proposal, noting among other things the presence of other statutory processes, is considered to be consistent with the Administrative Procedures. It is therefore concluded the EPA was justified in forming the view the proposal does not warrant formal assessment under Part IV of the EP Act with respect to the matters raised in this appeal ground.

## **GROUND 5: PUBLIC INTEREST AND CONSULTATION**

Many appellants were of the view that the public was not given sufficient notice or time (seven days) for comment on the proposal given the contentious nature of hydraulic fracturing and the widespread public concern regarding the development of the shale and tight gas industry in the Kimberley and the potential environmental and health consequences. Some appellants were of the view that the community had not been provided with clear and balanced

independent scientific information with respect to the environmental risks presented by hydraulic fracturing and the development of the shale and tight gas industry which many of the appellants considered have been demonstrated to occur elsewhere in Australia and overseas.

Yawuru Native Title Holders Aboriginal Corporation RNTBC submitted the EPA had not considered the concerns expressed by the Yawuru people, who are native title holders of the proposal area and whose law requires country, community and liyan (wellbeing and strong relationships) to be maintained and protected. The Yawuru people are particularly concerned about the risks to jilas (living waters) posed by the proposal. In discussions with the Office of the Appeals Convenor, Yawuru also expressed concern around the decision making timeframes and emphasised the importance for Yawuru people to have adequate time to develop an informed understanding of the potential environmental and social impacts of the proposal and the implications of any future development.

## **Consideration**

The EPA advised that the length of the comment period (seven days) was in accordance with the Administrative Procedures and that the intent of the public comment on referral is not meant to be a full scale public review of the environmental issues associated with a proposal, but is used to help gauge the public concern about the likely effect of the proposal on the environment. The EPA advised it received 16 comments on the referral of the Laurel Formation Tight Gas Pilot Exploration Program, compared to 242 comments received for the Drover-01 Exploration Well hydraulic fracturing proposal. The EPA also advised that under the Administrative Procedures, it can extend the comment period if it can be demonstrated there is a need. Given that other small scale hydraulic fracturing proposals that have recently been referred to the EPA had a comment period of seven days, the EPA advised that it decided that a seven day comment period for the Laurel Formation Tight Gas Pilot Exploration Program proposal was appropriate.

The EPA advised that it is aware that the proponent is undertaking community consultation with the local community, including Traditional Owners, with regards to their future plans in the Canning Basin. The EPA also advised that, under the Principles of Environmental Impact Assessment as laid out in the Administrative Procedures, the proponent must ensure that the public is provided with sufficient information about a proposal to allow the public to make informed comment as part of the environmental impact assessment process and that this includes ensuring good scientific information is available to support any claims being made about the impacts of hydraulic fracturing proposals. The EPA advised that it expects this consultation to continue so that the community has early access to adequate and accurate information to make informed comment about any proposal that the proponent plans to undertake.

The proponent advised that it is undertaking an extensive community engagement and consultation program, with the overarching aim of developing long-term and sustainable relationships with all stakeholders, particularly the Kimberley community. The proponent advised that it has been engaging with the broader Kimberley community through, for example, the Shire of Broome, regional Government agency representatives and sections of the business community such as the local Chambers of Commerce in Broome, Wyndham and Derby, and that since November 2013 it has launched a more intensive engagement with the broader community through initiatives such as a media community awareness campaign and community open days. The proponent also advised that it has been engaging with pastoralists, as well as with school communities.

The proponent advised that it has been actively engaging directly with Traditional Owners on whose land it is proposing to operate and who are key stakeholders in the proposal and potential resource development. The proponent advised it has established a formal joint

Traditional Owner 'Gas Road Map' process which provides a strategic engagement framework for the proponent and the relevant Traditional Owner groups to participate in the planning and assessment of environmental, social/cultural and economic outcomes of any potential gas development in the Canning Basin. To ensure Traditional Owners are well informed regarding the potential environmental risks and the best management practices associated with this proposal, it is understood the proponent is supporting independent specialist review panels for each of the different Traditional Owner groups, which will remain in place throughout the proposal to provide independent oversight and advice on the implementation of the proposal and monitoring results.

It is understood that, once the Environment Plan for the proposal has been approved by the DMP, and subject to legal review, the proponent is intending to make the Environment Plan (including the supporting documents) available on its website. It is also understood that during and following operations, the proponent will make all relevant environmental monitoring information available in a timely manner to the DMP, as well as on its website.

## Conclusion

By this ground of appeal, appellants contended that given the level of community concern about tight gas projects in the Kimberley, the level of public consultation undertaken by the proponent and the EPA was insufficient. There was also concern that the EPA failed to adequately consult with the Traditional Owners.

Taking into account the information presented in respect to this ground of appeal, it is considered that the level of consultation provided by the EPA was consistent with its Administrative Procedures and with the consultation undertaken for other proposals. It is also noted that the proponent is undertaking additional consultation with the community, including Traditional Owners, with regard to future development plans. Given the EPA's advice that the current proposal is a small, 'proof of concept' proposal, it is considered the level of public consultation undertaken by the EPA was appropriate. Insofar concerns raised by this ground of appeal relate to future commercial tight shale gas developments, the EPA stated that it expects the proponent to continue to provide the community with early access to adequate and accurate information to make informed comment about any proposal the proponent intends to undertake.

## GROUND 6: PROCESS ISSUES

This ground of appeal relates to general concerns raised by appellants in respect to the EPA's decision making process on the referral. Specific issues raised include:

- Decision on the proposal should be deferred until the outcome of the Legislative Council Standing Committee on Environment and Public Affairs '*Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas*'; and
- Regulatory framework for the management of shale and tight gas projects in Western Australia is inadequate, that the DMP has insufficient regulatory powers to adequately prevent projects impacting on the environment and that the EPA is deferring decision making to the DMP.

## Consideration

The EPA acknowledged that the Legislative Council Standing Committee on Environment and Public Affairs has commenced an '*Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas*', and advised that it is, however, obliged to consider proposals as they are submitted and in a timely manner. The EPA noted that the Inquiry is ongoing and it is understood there is currently no set date for when it is due to finish.

In relation to appellants' concerns that the EPA has deferred its decision making powers to the DMP, the EPA advised that in Western Australia, the DMP is recognised as the lead agency responsible for the regulation of shale and tight gas activities. The EPA also noted in Environmental Protection Bulletin No. 15 *Hydraulic Fracturing of Gas Reserves* that the potential environmental impacts and risks identified for hydraulic fracturing projects will be assessed within the DMP's regulatory framework in the first instance. The EPA advised it considered the proposal in accordance with the requirements of the EP Act and the Administrative Procedures and considered that the potential impacts associated with the proposal can be further evaluated, regulated and mitigated by the DMP and the DoW to meet the EPA's objectives for the environmental factors identified for the proposal.

With regards to the effectiveness of the DMP's legislative powers, the EPA advised the independent review<sup>10</sup> of the regulation of shale, coal seam and tight gas activities in Western Australia undertaken in 2011 found that the current DMP processes are adequate to manage environmental, workforce safety and resource risks. The EPA advised the review did recommend strengthening of the legislation and this principally focussed on improved transparency and public disclosure of environmental management plans and the chemicals being used in the process, rather than deficiencies in regulating the projects themselves.

The EPA advised that since the review, the DMP has progressed initiatives to enhance the regulatory framework, including strengthening the environmental aspects of petroleum regulations. It is noted these initiatives include:

- The gazettal in August 2012 of new petroleum environmental regulations, specifically the:
  - *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*;
  - *Petroleum (Submerged Lands) (Environment) Regulations 2012*; and
  - *Petroleum Pipelines (Environment) Regulations 2012*.
- New chemical disclosure requirements introduced with the new environmental regulations and which require details of all chemicals being used down a well to be publicly disclosed.
- The release in February 2014 of draft *Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2014* for stakeholder comment.

An inter-agency working group has been established to ensure a whole-of-government approach is taken to best practice regulation of the emerging shale and tight gas industry. Led by the DMP, it comprises representatives from the DoW, the DER, the Department of Parks and Wildlife, the Office of the Environmental Protection Authority (Office of the EPA), the DOH, the Department of Agriculture and Food WA, and the Department of State Development (DSD). The EPA advised that, through the Office of the EPA, it will continue to work with the inter-agency working group to ensure best practice regulation of the industry and that environmental matters are given proper consideration. In addition, a working group has been established to focus specifically on science issues relating to shale and tight gas.

With regards to the proponent's operations specifically, the EPA advised the DSD has established a Lead Agency working group that includes the Office of the EPA, the DMP and the DoW, as well as the proponent. The EPA advised that this working group will liaise with government agencies and the proponent, to ensure environmental issues are progressed in a timely and appropriate manner.

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<sup>10</sup> Hunter, T. (2011). *Regulation of Shale, Coal Seam and Tight Gas Activities in Western Australia*. Final Report prepared for the Department of Mines and Petroleum, Western Australia.



## Conclusion

Taking into account the information presented in respect to this ground of appeal, it is considered that the EPA must consider proposals on their merit and in accordance with the timeframes set in the EP Act. It is therefore concluded that the EPA was justified in determining not to assess the proposal prior to the completion of the Inquiry and Report by the Standing Committee on Environment and Public Affairs.

Taking into account that the EPA considered the proposal as a small scale, 'proof of concept' exploration proposal that is unlikely to have a significant effect on the environment and that the potential impacts can be further evaluated, regulated and mitigated by the DMP and the DoW to meet the EPA's objectives for the environmental factors identified for the proposal, and that decision of the EPA not to assess this proposal is consistent with Environmental Protection Bulletin No. 15 *Hydraulic Fracturing of Gas Reserves*, it is concluded the EPA was justified in forming the view the proposal does not warrant formal assessment under Part IV of the EP Act. It is also noted that, in accordance with the Administrative Procedures, in making its decision on whether to assess the proposal, the EPA considered the values of the environment; the extent of the likely impacts; policies, guidelines, procedures and standards against which a proposal can be assessed; the presence of other statutory decision making processes which regulate the mitigation of the potential effects on the environment and the level of public concern.

## RECOMMENDATIONS

For the reasons outlined in this report, it is considered that the EPA was justified in forming the view this proposal does not warrant assessment and the subsequent setting of formal conditions by the Minister for Environment under Part IV of the EP Act.

In reaching this conclusion, the EPA's advice that this is a small scale, 'proof of concept' exploration drilling proposal, of limited duration, that is unlikely to have a significant effect on the environment was noted, and that the potential impacts can be further evaluated, regulated and mitigated by the DMP and the DoW to meet the EPA's objectives for the environmental factors identified for the proposal.

It is also specifically noted that this decision relates only to the proposal as referred, and that any future commercial development by the proponent of tight shale gas will be subject to the EP Act in the normal way. In this regard, the EPA's advice that the proponent should continue consulting with the local community, including Traditional Owners, in respect to future plans for the area is supported.

It is therefore recommended that the appeals be dismissed.

Kelly Faulkner  
**APPEALS CONVENOR**

**Investigating Officer:**  
Stephanie Turner, Senior Environmental Officer

## **ATTACHMENT 1: LIST OF APPELLANTS**

- 350 Perth, 350 Australia (016/14)
- Ms Elizabeth Antipas (018/14)
- Australian Conservation Foundation (020/14)
- Ms Lou Baxter (021/14)
- Ms Elizabeth Brooke (025/14)
- Ms Nicole Campbell-Watts (026/14)
- Hon Robin Chapple MLC (028/14)
- Ms Joanne Daniels (030/14)
- Doctors for the Environment Australia (033/14)
- Ms Christine Elsasser (034/14)
- Environs Kimberley Inc and Conservation Council of Western Australia (035/14)
- Ms Sandra Faber (036/14)
- Mr Paul Ford (038/14)
- Dr Sue Foster (039/14)
- Dr Greg Glazov (041/14)
- Ms Birgit Graefner (043/14)
- Mr Bryce Hobbs (047/14)
- Ms Christie Kingston (051/14)
- Ms Carmel Leahy (053/14)
- Ms Meredith Luke (054/14)
- Ms Kirsten Lunoe (055/14)
- Mr David Lunt (056/14)
- Mr Michael Mardel (057/14)
- Ms Clare Marquis (058/14)
- Ms Tanyia Maxted (060/14)
- Ms Patricia McAuliffe (061/14)
- Ms Simone McInnes (062/14)
- Ms Louise Middleton (063/14)
- Ms Penny Newcombe (065/14)
- No Fracking WAy (067/14)
- Ms Vivienne O'Shea (069/14)
- Ms Katherine Parolo (071/14)
- Ms Caitlin Pilkington (075/14)
- Dr Anne Poelina (076/14)
- Ms Arleen Schmertz (078/14)
- Dr Linda Selvey (080/14)
- Mr Daniel Smith (081/14)
- Ms Melanie Smith (082/14)
- Ms Alison Southern (083/14)
- Ms Helen Sturmey (086/14)
- The Wilderness Society WA Inc (087/14)
- Ms Diana Tomkins (088/14)
- Ms Yeeda Topham (090/14)
- Dr Johannes Wajon (091/14)
- Ms Fiona West (092/14)
- Mr Kimberley West (093/14)
- Mr Clint Westwood (094/14)
- Yawuru Native Title Holders Aboriginal Corporation RNTBC (096/14)