9 October 2013
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Dr Jan Wright
Parliamentary Commissioner for the Environment
PO Box 10-241
Wellington 6143

Dear Dr Wright

Submission on the future regulation of fracking

Please find attached a submission from the Taranaki Regional Council in response to your first (interim) report on the environmental impacts of fracking in New Zealand. Also attached as appendices to the submission are a number of supporting reports, studies and investigations.

I have also sent the Council's primary submission to you electronically today (9 October 2013) noting that not all the Council's webpage connections contained in the appendices to the submission are there at the moment. We expect these will be fully available by this Friday 11 October 2013.

You will see that the submission itself is relatively large – running to over 60 pages – and comprehensive in scope. We have taken some time and effort in putting the submission together because we think it important that your second phase investigation into the regulation of fracking is able to benefit from the experience of the Taranaki Regional Council in regulating the oil and gas industry in Taranaki over many years, and where we see opportunity for positive change.

The first part of the submission 'looks back' and lays out Taranaki's record but then importantly 'looks forward' addressing the findings of your interim report and recommending some changes to the regulatory framework that could occur and which we think could make the various interagency roles seamless and even more efficient and effective in the regulation of fracking.

Our key recommendation is the removal of the duplication between regional councils and (as it currently stands) the High Hazards Unit of the Ministry of Business Innovation and Employment to be both involved in regulating well integrity. It is this aspect of fracking that is fundamentally important to avoiding the potential for adverse environmental impact and providing public assurance that fracking can be undertaken safely. We see benefits in this highly specialised technical task being done by the central expert body (who need to gear up to do it properly) with councils being then able to rely on High Hazards Unit work as sufficing for Resource Management Act purposes.

A good deal of the supporting material is in the form of expert and independent technical investigations or studies commissioned by the Council on various aspects of fracking operations. These range from hydrogeologic and seismic impact and risk investigations to assessment of flare emissions, radioactivity, and waste disposal, including by deepwell injection and landfarming. All the evidence points to fracking operations having no significant adverse environmental effects, with this activity being managed effectively and appropriately monitored for compliance.

However, as noted above, and expanded on in our submission, we believe improvements can be made in the regulatory framework to remove duplication for the regulation of well integrity in favour of a central location for this specialist area. The Regulations governing this area have recently (June 2013) been updated and expanded but further amendments are required to better integrate the different regulatory regimes. This should not be a major legislative exercise but would ensure that the regulatory regime is efficient and fit for purpose. It is imperative that hand-in-hand with tweaking of the regulatory framework, central government commits the necessary resources to practical on the ground monitoring and enforcement of the Regulations which has not always been the case to date. This will provide public assurance that international good practice is indeed being applied in this country.

The Council would be happy to provide your office with further information or clarification of any of the matters raised in its submission.

Yours faithfully

BG Chamberlain
Chief Executive

SUBMISSION OF TARANAKI REGIONAL COUNCIL

TO

PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT

ON THE FUTURE REGULATION OF FRACKING

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1. INTRODUCTION AND OVERVIEW

1.1 This submission responds to the interim report of the Parliamentary Commissioner for the Environment ("**PCE**") entitled "Evaluating the Environmental Impacts of Fracking in New Zealand" (November 2012) (the "**interim report**"). In commenting specifically on fracking, this submission logically addresses wider issues in relation to the oil and gas industry.

1.2 The submission seeks to assist the Parliamentary Commissioner's "Phase 2" investigation into "how well the environmental risks associated with fracking are actually regulated and monitored" (Commissioner's Report, page 5).

1.3 A crucial consideration in evaluating or recommending the need for changes to any system of environmental regulation is to be sure there is a clear, evidence-based, understanding of the context in which to properly evaluate future regulatory needs.

1.4 In evaluating the need, or otherwise, for regulatory reform it is essential to carefully assess the actual evidence of tangible environmental problems which illustrate regulatory gaps or deficiencies. It would be questionable to simply conclude there is need for major regulatory reforms by relying on generalised, concerns or unspecified risks. Similarly, regulatory reform should not be unduly influenced or driven by political pressures associated with contentious broader public policy issues, such as the perceived role of fracking in "prolonging" dependency on fossil fuels or related global warming issues.

1.5 Fracking is not a novel or unique activity to New Zealand. It forms part of the evolving and well-understood operations of the long-established oil and gas industry, primarily in Taranaki. Forms of fracking have been commonly used in the oil and gas industry for over 60 years. The process is now a mature and highly developed technology. It is relatively sophisticated and highly engineered.

1.6 Generally, in New Zealand, fracking operations, as part of oil and gas operations, have been subject to regulatory monitoring to determine compliance with the Resource Management Act 1991 and resource consent conditions and to determine the potential for adverse effects on water quality. Like any industrial process fracking can pose risks if mismanaged or is irresponsibly undertaken. To date there is no evidence that fracking operations in Taranaki have had any adverse effects on water quality or other environmental values.

1.7 The other crucially important context in which to evaluate the need for regulatory responses to fracking is that the environmental concerns or risks which have arisen in other countries – particularly the United States ("**US**") – cannot be readily or reliably assumed to apply in New Zealand. This is due to a combination of factors which materially differentiate New Zealand – including basic hydrogeological characteristics and more comprehensive regulatory capacity, control and monitoring.

1.8 As noted in a recent GNS report (Hydraulic fracturing for oil and gas development: Environmental concerns and regulation. GM Zemansky GNS Science Consultancy Report 2012/83, March 2012, page 5):

> *"the scale of HF operations in the US greatly exceeds what has occurred historically or is likely to occur in New Zealand in the future. Both the numbers and sizes of operations in New Zealand are much less than is the normal case in the US."*

1.9 Comparators abound to provide relative context. In the US Texas Barnett Shales some 9,400 wells (mostly horizontal wells) were drilled to between 2 and 5 kilometres over a six year period with most of these wells fracked. This compares to 65 fracking operations that were undertaken in 39 wells in Taranaki between 1989 and mid 2011. Taking these comparisons to the US and other jurisdictions, it can be seen that New Zealand's scale of activities and issues are extremely modest.

1.10 Also as noted in the GNS report quoted above (page 43), a number of incidents in the US have been predominantly seen in relation to unconventional shale gas recovery. Government agencies at all levels in the US were "unprepared to deal with this rapidly expanding industry". Even so, violations of legal requirements are estimated to have occurred rarely (1-2% of drilling permits) and not all violations resulted in adverse environmental effects.

1.11 In this context it is also instructive to note the key conclusion of the authoritative Royal Society and Royal Academy of Engineering report (Royal Society and Royal Academy of Engineering, June 2012. Shale gas extraction in the UK: A review of hydraulic fracturing). This Report dealt primarily with the health, safety and environmental risks associated with extraction of shale gas in the United Kingdom and concluded that risks:

"can be managed effectively as long as operational best practices are implemented and enforced through regulation" (page 4).

1.12 By definition shale gas extraction involves considerable higher potential risks for water quality than the hydrogeological conditions found in Taranaki yet it was still clearly concluded that operational best practices can effectively manage water quality issues.

1.13 In the context of the current New Zealand regulatory regime, there is no evidence of any significant adverse environmental effects, or other significant evidence, suggesting that the existing regulatory regime is deficient or inadequate in terms of controlling and minimising the key environmental risks posed by fracking. In general, regulation of potential environmental effects has worked reasonably well within a framework of continuous improvement. It is accepted that there is room for fine tuning and improvement of current regulatory requirements, for example, the better integration of health and safety with environmental regulation. In addition, while water quality monitoring has been generally undertaken by Taranaki Regional Council ("**TRC**" or "**the Council**") in a consistent and comprehensive manner the same cannot always be said for past monitoring of regulatory compliance by central government agencies with relevant responsibilities. For example, recent evaluation of the monitoring of compliance with Hazardous Substances and New Organisms Act 1996 ("**HSNO**") requirements by the former Department of Labour indicates that for 2012, less than 3% of premises using hazardous substances were inspected for compliance with HSNO requirements (Environmental Protection Authority, 2012. Hazardous substances and new organisms compliance and enforcement: Report on enforcement agency activities for the year ended 30 June 2012 and intentions for the year ending 30 June 2013. Report to the Minister for the Environment).

1.14 All of the key risks or concerns identified in the PCE interim report are risks or concerns currently covered by a variety of regulations. While there is inevitably some complexity in terms of respective administrative or legal responsibilities it is hardly accurately described as a "labyrinth". While there may be good arguments for improvements to be made to the integration of regulatory requirements or monitoring and enforcement there is no credible evidence of novel environmental threats or systemic issues warranting urgent or radical regulatory solutions.

1.15 The notion that improving regulation may be achieved by further centralisation of regulatory functions in relation to fracking is highly questionable. The key environmental issue, that of water contamination, is already comprehensively regulated at the regional council level under the Resource Management Act ("**RMA**"). Other land use related issues are also best regulated at the local council level in accordance with the well-established approaches of the RMA.

1.16 Beyond the territorial sea, recent legislation has placed jurisdiction for regulatory control with the Environmental Protection Agency. This Agency has no specific experience or role in regulating specific fresh water quality issues.

1.17 One area where legislative amendment would add significant value to the regulation of fracking is in the critically important area of regulating well integrity. Under the current regulatory framework there is duplication of this function with the High Hazards Unit currently within MBIE responsible for ensuring all aspects of well integrity under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013. Ensuring well integrity is the key element in addressing potential environmental impacts, particularly water contamination, which as noted above, is regulated by regional councils under the RMA. This duplication of function should be removed in favour of a central location for this important aspect of the regulatory regime. This is a highly technical, specialised and costly area to resource and there are very limited resources and expertise available in New Zealand.

1.18 It should be made clear in law that regional councils can rely on the Petroleum Regulations in respect of well integrity and not have to duplicate this capability and capacity which would be costly and inefficient for councils, the industry and New Zealand as a whole.

1.19 The structure of this submission is as follows:

Section 1: contains an introduction and overview;

Section 2: outlines the TRC's experience in regulating the oil and gas industry in Taranaki, including fracking;

Section3: sets out the current regulatory requirements relevant to fracking;

Section4: considers and comments on the PCE's interim findings in relation to regulatory issues;

Section 5: sets out the case for future regulatory change;

Section 6: looks more closely at the issue of well integrity and the avoidance of regulatory duplication; and

Section 7: makes recommendations for legislative change.

1.20 Throughout the submission, other issues or opportunities, for example the need to address well abandonment legacy issues, are raised.

2. THE TARANAKI EXPERIENCE

2.1 In New Zealand the oil and gas industry has a lengthy history – concentrated in Taranaki. TRC has practical experience built on regulating the oil and gas industry for over 30 years. This section of the submission briefly summarises the TRC's overall approach to regulation of the oil and gas sector before moving onto specific aspects of the industry that have been the subject of investigation by the Council to inform its regulatory responses. These areas cover hydrogeologic risk assessment and seismic impact and risk assessment associated with fracking activities, flare emissions, radioactivity in hydrocarbon exploration, deepwell injection and landfarming of drilling wastes.

Regulation of the oil and gas industry in Taranaki: Overall approach

2.2 Over the last 30 years the TRC and its predecessors have assessed and issued a total of 846 resource consents for hydrocarbon exploration and production activities. These involve all types of consents across the full range of hydrocarbon exploration and production activities from well-site water takes; to waste treatment and disposal; landfarming; deepwell injection; production station operations, tankfarm and port operations and, more recently, fracking. The Council also regulates and monitors all aerial emissions, including any potential fugitive emissions from wellsites. The total number of resource consents held by hydrocarbon exploration and production activities in the Taranaki region is 692 or about 15% of all current consents on the TRC's database.

2.3 Most of the resource consents are discharge or water permits and these are processed in accordance with the requirements of the RMA and policies and rules in the Council's Regional Fresh Water Plan that regulate various aspects of the oil and gas industry.

2.4 The drilling and construction of wells and bores is also regulated under the Regional Fresh Water Plan. The Commissioner's interim report is misleading in relation to the Council's regulation of well drilling and construction (refer section 5.3 'Drilling and constructing the well' page 56 of the interim report). The interim report states that in most district and regional plans, drilling a well is a permitted or controlled activity and in both cases 'drilling will always be allowed' but will be subject to conditions. While drilling a well is a permitted activity in the Council's Fresh Water Plan as noted in the interim report, that activity is subject to conditions which if they cannot be met, will require a resource

consent. In Taranaki that will be a discretionary activity consent which the Council may grant or decline. It is therefore not accurate to state that drilling 'will always be allowed.'

2.5 The interim report gives an example of a condition in the Hawke's Bay plan that may be put on a resource consent to drill. That condition is very similar to the condition in TRC's permitted activity rule regulating the drilling of wells.

2.6 The interim report also makes broad claims of 'light-handed regulation' with companies 'not only regulating themselves, but monitoring their own performance' (page 77). There is no basis to assert that the TRC is a passive regulator reliant on industry self-regulation. The Council is very much an active, on-the-ground regulator of the oil and gas industry in Taranaki. Fundamental to the Council's approach is a rigorous and integrated monitoring, inspection and enforcement regime. This includes regular site inspections, and sampling, for consent compliance monitoring purposes, consent investigations, incident investigations, and advice and information to the industry. In the last 30 years there have been over 4,500 site visits and more than 13,000 compliance monitoring inspections of specifically consented oil and gas activities.

2.7 Inspections are complemented by appropriate water, soil and air, physicochemical and biological sampling surveys, which are conducted by trained professionals, using accredited laboratories. In the last 10 years, the Council estimates sampling has involved over 700 freshwater bio-monitoring surveys, and over 4,600 water or soil samples, with around 30,000 parameter analyses. Freshwater biological surveys around new exploration sites were severely scaled back a few years ago, because of the lack of any effects being found.

2.8 Overall, in the last 10 years, there have been over 20,000 recorded interactions with the oil and gas industry as part of the Council's regulation of the industry.

2.9 The TRC takes action where it does find cases of non-compliance. And as with any resource use sector, there are non compliance incidents, most of which are minor in nature. There is little evidence of any significant environmental effects arising from these incidents. Two Taranaki incidents or examples resulting in environmental contamination are referred to in the interim report: the McKee well

blowout in 1995 and soil contamination beneath blowdown pits at several Kapuni well sites.

2.10 The most significant incident was that which occurred at the McKee 13 well site in 1995. This was a moderate event, where stream recovery occurred within 18 months after contamination, but for which the company was prosecuted with a record fine for the time. Significantly, and with the Council's strong support, New Zealand's first specific petroleum regulations were promulgated following the McKee event. Prior to these regulations there was just a reliance on the general provisions of the Health and Safety in Employment Act 1992.

2.11 At Kapuni there is localised contamination, mainly of soil, beneath blowdown pits at six well sites. The contamination has been publicly reported for several years. Water supplies are not affected and have been expertly assessed as being at low risk. Nevertheless, the Council moved to regulate the situation and has required a detailed investigation and remediation response which is now close to completion and is being professionally conducted. Evidence clearly identifies that hydraulic fracturing was not the root cause of this issue, even though some wells have been subject to fracturing. Rather it is a legacy issue, caused by now discontinued well management practices, at well sites up to half a century old. It should also be noted that in this time prior to the Resource Management Act 1991, there was highly questionable authority to regulate these activities under the then Water and Soil Conservation Act 1967.

2.12 In terms of non-compliance within the oil and gas sector in the last 10 years the Council has issued 13 abatement notices and 9 infringement notices (instant fines). There have also been two prosecutions by Council against oil and gas companies for more serious breaches of the RMA in the last decade.

2.13 It is worth noting that across all resource uses over the same time period, the Council issued well in excess of 1,000 abatement notices and about 400 infringement notices and completed 35 prosecutions.

2.14 The Council scrutinises the oil and gas sector very carefully and closely, but enforcement interventions are significantly less common than for other sectors. This is no accident. It reflects and requires dedicated industry focus on environmental compliance and significant investment by the sector. The performance of the oil and

gas sector, backed by close regulatory oversight, has produced a generally commendable environmental record and low overall environmental impact.

2.15 **Attached** as Appendix 1 are examples of annual TRC compliance monitoring reports covering different aspects of the oil and gas industry.

2.16 In addition to site-specific compliance monitoring, the Council conducts wide ranging state of the environment monitoring to identify the state and trends in overall environmental conditions across the region and over time. The Council has a very extensive record of physicochemical and biological freshwater sampling which is now of a long enough duration, to provide statistically robust analyses. These reports are showing long term improvements in ecological health at most sites monitored and physicochemical water quality trends that are the best they have ever been. Highlights include a net halt in previously worsening nutrient levels and improvements at many sites over the most recent seven years. Every measure of organic contamination, bacteria and aesthetic quality at every site is now showing only improvement or stability, not deterioration, over the same period.

2.17 **Attached** as Appendix 2 are two of the most recent state of the environment reports for freshwater ecological quality and freshwater physicochemical quality.

2.18 Specifically in relation to fracking, it is worth noting that hydraulic fracturing has been occurring in Taranaki since the late 1980s, although in much lower numbers than in other petroleum producing regions overseas. Some 65 fracking operations have been undertaken in 39 wells between 1989 and mid-2011. In all cases fracking has been used to stimulate oil and gas wells targeting tight sandstone reservoirs at considerable depth below freshwater aquifers.

2.19 In all the years that the Council has been regulating, monitoring and inspecting petroleum sites and operations, it has not found or been made aware of any significant adverse effects from hydraulic fracturing or from disposal of drilling wastes (including from fracking) to land.

2.20 Good industry practices are the norm for petroleum operators in Taranaki. These practices are a stated requirement of the licence from central government. This combined with the particular

geological and oilfield characteristics in Taranaki, management and monitoring by the petroleum industry itself and on-going monitoring and site inspections by the Council has meant that any adverse effects from hydraulic fracturing operations are likely to be minor and therefore no specific resource consents were required up until mid-2011.

2.21 It is noted that this is not an uncommon approach. In the UK, they do not require consents for underground discharge of fracking fluids nor is it intended to require this in future. UK petroleum permits are considered sufficient to address this issue and the risks of adverse effects are very low if those permits are adhered to.

2.22 The Council considers it would be highly instructive in moving forward on this issue in New Zealand, to closely examine the UK approach, which TRC staff have examined and discussed first hand with regulators in the UK. As noted above, a critical point of interest is that the UK Environment Agency (equivalent to regional councils in New Zealand), does not as a matter of course, require the equivalent of our discharge permits for fracking. The Environment Agency is of the view that these matters are covered by the health, safety and environment bore-hole permits that are required and administered by their Health and Safety agency and Department of Energy and Climate Change, as well as the local planning authority. The equivalent for us is the High Hazards Unit of MBIE. The Environment Agency is clear that they would be simply duplicating that work if they were also to require subsurface discharge permits as standard practice. They can however have input into the regulatory processes of other regulatory agencies and require a permit application if they wish. The relevant agencies have also developed strong working relationships, including memoranda of understanding, to ensure coordinated and integrated management.

2.23 With the ramping up of hydraulic fracturing operations in the region, and legal advice that the Council could in fact require resource consents for this activity, the Council adjusted its regulatory response to require resource consents for fracking activities from August 2011. It is important that this change in regulatory approach is viewed in context as an additional level of public assurance rather than a clear cut legal or environmental need or requirement. An important factor in the Council's decision to exercise its discretion to require resource consent, was the need for certainty and for the public and operators to have assurance that there were no gaps in consents due to

uncertainty or lack of clarity. The Council reiterates that regulation of these activities was and is still being carried out by other authorities including MBIE and as a consequence there is some duplication of regulatory effort. To date, 21 resource consents have been issued and comprehensively monitored by the Council, for hydraulic fracturing operations.

2.24 Conditions on hydraulic fracturing consents require, amongst other things, that the consent holder provides pre- and post-fracturing discharge reports. These reports contain comprehensive and detailed operational diagnostic information which the Council uses to evaluate the performance and outcome of a fracturing operation.

2.25 The design of the Council's hydraulic fracturing monitoring programmes has incorporated best practice monitoring guidance from regulatory bodies overseas and expert independent advice.

2.26 Monitoring results of hydraulic fracturing consents granted to date show no evidence of any contamination by hydraulic fracturing fluids or hydrocarbon reservoir leakage. Monitoring is carried out regularly throughout the year with monitoring reports prepared annually and reported to the Council and the public.

2.27 **Attached** as Appendix 3 are examples of TRC monitoring programme reports for hydraulic fracturing. The associated resource consents and their conditions are included within these reports.

2.28 The Council has developed a guide to regulating oil and gas exploration and development activities under the RMA. The guide is primarily intended for the information of consenting, monitoring and enforcement staff in regional councils, district councils and other regulators, to promote good practice in this area, and is based on over more than 30 years of regulatory experience in Taranaki. The guide is also intended to promote a consistent and integrated approach to regulating petroleum exploration throughout New Zealand, among the various agencies involved. This is the first such document prepared in New Zealand.

2.29 The guide sets out expectations in relation to all stages of the consenting and monitoring process including the assessment of environmental effects, the types of resource consent conditions that can be expected and why, as well as compliance monitoring.

2.30 **Attached** as Appendix 4 is a copy of the Council's 'Guide to regulating oil and gas exploration and development activities under the Resource Management Act.'

2.31 In preparing the guide the Council is the first to appreciate and acknowledge that more than most industries, oil and gas technologies and methods evolve rapidly which can very quickly lead to redundancy in prescriptive approaches to regulation. As a result regulations here and overseas are goal or outcome focused but are underpinned by more detailed guidelines (currently being prepared by the High Hazards Unit in MBIE), which can be updated as required. On the other hand, the Council operates under the RMA which has a more prescriptive approach to the making of rules and regulations but the Council recognises the need to balance both approaches.

Hydrogeologic risk assessment

2.32 The Council has undertaken an assessment of the hydrogeologic risks associated with the practice of hydraulic fracturing of hydrocarbon reservoirs in Taranaki up to mid-2011. Oil and gas companies operating in the Taranaki Region that have undertaken hydraulic fracturing operations up to mid-2011 (or their successors) provided data for this investigation and assessment. The Ministry of Economic Development also provided data. The first hydraulic fracturing operation was in 1989.

2.33 The report was originally released in November 2011, with data from the period 2000 to mid-2011 but updated in February and May 2012 to include an assessment of all hydraulic fracturing data. The assessment has been peer-reviewed by Dr G.M. Zemansky, Senior Hydrogeologist with the Institute of Geologic and Nuclear Sciences Ltd (GNS Science).

2.34 This GNS Science peer review supports the assessment and conclusions of the Council.

2.35 The key findings of the Council's assessment were as follows:

- The data provided shows that during the period 1989 to mid-2011 a total of 65 hydraulic fracturing operations were undertaken in 39 wells accessing oil and gas reservoirs that are up to 4 km underground, with the majority deeper than 2.4 km. The shallowest fracturing treatment occurred at 1.15 km at the Manutahi well sites, at 1.36 km at the Kaimiro well sites, at 1.56 km at the Ngatoro well

sites, and at 1.75 km at the Cheal well sites. These relatively shallow activities were assessed in more detail in the report. No impacts on groundwater quality from hydraulic fracturing were found.

- Most of the ingredients used in fracturing fluids are found within products that are widely used in society, including in products used in the home. While most of the additives used in fracturing are toxic in their concentrated (pure) product form, as shown by MSDS sheets, they are severely diluted (97.5% municipal water, 2.5% chemicals) by the water carrier and, therefore, are present when injected into the target reservoir at relatively low concentrations. Indeed, most of the chemicals/additives are only mixed with the water-based fluid, as the fluid is being pumped downhole. However, even in these low concentrations care is needed with some of these products to avoid any potential impacts on human health. Therefore, regulation of their use and disposal is appropriate.

- If hydraulic fracturing operations are carried out properly, it is unlikely that contaminants will reach overlying freshwater aquifers in the Taranaki region. Although unlikely, it is not impossible. The report identified four potential routes for that to occur: leakage through well casing or annular space due to defective installation or cementing; leakage through the natural geology overlying the hydrocarbon reservoir; leakage from improper handling of chemicals used and/or from hydraulic fracturing wastewaters (i.e., flow back or produced water from the formation) brought back to the surface at the well site; or a well blowout resulting in underground leakage into aquifers or surface recharge via spillage. The report noted that the probability of a well blowout is extremely small, but cannot be completely discounted and has occurred during hydraulic fracturing operations in other countries.

2.36 The Council's review of the hydraulic fracturing operations which have been conducted in the Taranaki Region from 1989 to mid-2011 did not find any evidence of related environmental problems. The report concluded that there is little risk to freshwater aquifers from properly conducted hydraulic fracturing operations in the Taranaki Region. This assumes a combination of natural geologic factors, the use of good practices by industry and regulation by the Council as follows:

- Satisfactory methods for well design, installation and operation are used by the petroleum industry, as well as quality control checks to ensure well installation integrity;

- Hydraulic fracturing occurs in deep reservoirs well separated from shallow freshwater aquifers (i.e., about 3,500 metres below ground level, in comparison to freshwater aquifers less than 1,000 metres below ground);

- The presence of thick intervals (thousands of metres) of shales and mudstones, which act as seals to trap the hydrocarbons in place; and

- Operational management and monitoring by the petroleum hydrocarbon industry and regulation and monitoring (including sampling and auditing operational data) by the Council.

2.37 Although the risk that properly conducted hydraulic fracturing operations could adversely affect freshwater aquifers is very low, the Council recognises that the level of risk is greater when hydraulic fracturing is carried out at relatively shallow depths below freshwater aquifers, due to the proximity of the target reservoirs and the overlying aquifers. In such cases, a more stringent regulatory oversight is called for.

2.38 As noted earlier in this submission the Council now requires resource consents for all subsurface fracturing discharges to land beneath the region. Compliance monitoring of the discharges is undertaken and reported to the Council and the public.

2.39 **Attached** as Appendix 5 is a copy of the report: Taranaki Regional Council, 2012. Hydrogeologic Risk Assessment of Hydraulic Fracturing for Gas Recovery in the Taranaki Region.

Seismic impact and risk assessment

2.40 Late in 2011 the Council commissioned GNS Science to determine if there is any evidence for hydraulic fracturing triggering seismic activity in Taranaki, how that is assessed, and what the effects on people and structures could be if hydraulic fracturing were to trigger earthquakes in Taranaki.

2.41 The GNS study also examined the potential for effects from deepwell reinjection. This was done because deepwell reinjection is an activity that is 'bundled' within the public's awareness with hydraulic fracturing. Much of the public discussion about overseas events confuses hydraulic fracturing with deepwell reinjection, which involves

greater volumes of liquid (mainly saline water) but at much lower pressures that are selected so as not to fracture the formation.

2.42 GNS Science reported to the Council in February 2012. The report concluded that:

- There is no evidence that hydraulic fracturing activities in Taranaki have had any observable effect on natural earthquake activity.
- It is unlikely that hydraulic fracturing would induce any earthquakes in the Taranaki region that would have a significant effect.
- There is no evidence that long term deepwell reinjection activities in Taranaki have had any observable effect on natural earthquake activity.
- There is no evidence that hydraulic fracturing or deepwell reinjection activities in Taranaki would have any observable effect on volcanic activity.

2.43 The conclusions of the report are based on a study of 3,300 recorded earthquakes between 2000 and late 2011, looking particularly for those that occurred within 10 km of any hydraulic fracturing location and within three months of hydraulic fracturing occurring at the location.

2.44 In short, there is no evidence of any observable effects from the past fracking activity and the risks of substantial effects in future are considered most unlikely. Indeed from the discussion in the body of the report, where the forces and dynamics involved with natural seismic and volcanic events are compared with those of hydraulic fracturing, the authors note that the maximum hydraulic fracturing induced seismic event that could be credibly envisaged in Taranaki would be very shallow and non-damaging, though gently felt nearby. In this context 'gently felt' is the same order of sensation that can accompany a heavy lorry rumbling past you.

2.45 The GNS investigations and report brings scientific objectivity and robustness to a topic where comment is often emotive rather than factual.

2.46 **Attached** as Appendix 6 is a copy of the report Sherburn, S. 2012. An assessment of the effects of hydraulic fracturing on seismicity in the Taranaki region. Consultancy report 2012/50, GNS Science, Wairakei.

Assessment of flare emissions

2.47 The Council has previously investigated the nature of air emissions and downwind effects arising from the flaring of hydrocarbons (both natural gas and condensate) at exploration sites. This information has proven valuable in the development of robust and defensible technical requirements for incorporation into the Council's regional air quality plans, and for assessing applications for discharges to air from flaring at exploration and production sites. The combustible flows to flare pits giving rise to flaring activities will initially include entrained materials used in drilling activities, such as drilling mud residues.

2.48 However, more recently some speculation has also focused on the nature of potential effects arising from aerial emissions that are or might be associated with the use or disposal of hydraulic fracturing fluids as these fluids include compounds such as biocides, gelling and gel-breaking agents, inert proppants (e.g. sand or microscopic ceramic beads), and 'slicking' agents, that are additional to those used in conventional drilling.

2.49 Normal exploration practice is to separate the produced fluids from the entrained hydrocarbon gas. However, under emergency circumstances, safety and equipment protection requirements may necessitate the discharge of the fluids to a flare pit without separation so that the entrained hydrocarbon gas can be combusted for reasons of safety. In this situation, some of the fluids will be combusted/evaporated with the gas, with the majority remaining within the pit for recovery from the pit at some point after the emergency event is under control. While used at extremely low concentrations within the hydraulic fluids (which comprise approximately 98% water and proppant), the presence of hydraulic fracture compounds within the mixture entering a flare raises the possibility of additional environmental effects.

2.50 The Council therefore undertook a study of the nature of flare characteristics and downwind consequences, at a wellsite in North Taranaki in February 2012. It should be noted that the fracking fluids used within this study had additives at a somewhat higher concentration than is typical. The study design was subject to peer review. It reflected and developed the original flaring investigations conducted by the Council in 1998.

2.51 The investigation covered combustion zone emissions of particulate matter (PM), dioxins and furans (PCDD/PCDF), polyaromatic hydrocarbons (PAHs), aldehydes (formaldehyde, acetaldehyde, and propionaldehyde), volatile organic compounds (VOC), including BTEX, methanol, and the more conventional products of combustion (oxygen, carbon dioxide, carbon monoxide, nitrogen oxides, and sulphur dioxide).

2.52 Emissions from the fluid surface were collected to determine emissions (evaporation) of PAHs, aldehydes, VOCs, and methanol. Ambient (downwind) measurements covered particulate (of particle sizes PM 1.0, 2.5, and 10), carbon monoxide and dioxide, formaldehyde, and volatile organic compounds.

2.53 The overall findings of this study were that there were minimal effects upon ambient air quality in the vicinity of a flare at which the incidental combustion of hydraulic fracturing fluids was undertaken, in the context of prevailing air quality within the region and nationwide.

2.54 It should be noted that the results of this study related to a field study carried out under specific source, topographic, and meteorological conditions, which means they cannot be applied universally. It can be noted that the results of this study are consistent with and uphold those of the air quality studies of flaring (field monitoring and modelling studies) conducted in 1998 which established that a separation distance of 300 metres between a flare and residential dwellings gave a substantial health and safety buffer for the protection of local populations.

2.55 **Attached** as Appendix 7 is the full report: Taranaki Regional Council, 2012. Investigation of air quality arising from flaring of fracturing fluids emissions and ambient air quality. Technical Report 2012-03.

2.56 To gain greater value and more regional application from this study, dispersion modelling under varying conditions was undertaken. The modelling work was carried out by a recognised and independent air modelling expert Dr Duncan Backshall of Air Quality Management Ltd. The key finding of the study completed in March 2013 is:

'maximum predicted concentrations from the screening study are well below the relevant guidelines and standards for the pollutants assessed. Many of the assumptions that were made to determine ground level concentrations are conservative or highly conservative, so it is

reasonable to conclude that the disposal of fracturing fluid by flaring should not result in any adverse effects beyond the well site.'

2.57 As with the 2012 study, a wide range of compounds were assessed including volatile organic compounds (such as BTEX), formaldehyde, combustion gases and particulates. No contaminant concentration was found to even approach guideline or standard values. As already noted, the modelling was very conservative (i.e. gave higher than realistic results) which introduced a further degree of precaution and assurance.

2.58 The use of modelling in this study overcomes the challenges raised regarding the universality of the earlier field data.

2.59 **Attached** as Appendix 8 is a copy of the report: Air Quality Management Ltd, 2013. Atmospheric dispersion modelling of discharges to air from the flaring of fracturing fluid.

Radioactivity in hydrocarbon exploration and production

2.60 Previously overseas, and more recently within New Zealand, questions have been raised around whether radioactivity is associated with hydrocarbon exploration and production. There are two central issues: does the recovery of natural gas, oil and condensate bring with it the potential for release of naturally occurring radioactive materials (NORMs), and secondly, is there a health risk associated with the use or disposal of radioactive isotope tracers that may be used during activities associated with hydrocarbon drilling or fracturing?

2.61 It should be noted first of all that the use or release of radioactive materials is a matter under the jurisdiction of the Ministry of Health, and enquiries on this issue should be directed to that agency in the first instance. The TRC has sought or welcomed information provided on radioactivity related to hydrocarbon exploration and production, for the sake of reassurance and public confidence. To the extent that radioactivity might be present in a discharge for which the Council has regulatory control under the RMA, the Council would also have a degree of statutory function in this regard (but notwithstanding the explicit role of the Ministry of Health).

2.62 The Council has been addressing the issue for close to twenty years, for its own information and to respond to public enquiries made from time to time. More particularly, there has been recently something of a concerted focus on radioactivity through the media, which might

be seen as one aspect of a wider conversation on the pros and cons of the introduction of fracturing as a means of enhancing hydrocarbon production.

2.63 In 2013 the TRC prepared a report summarising the Council's work and findings in this area. It addressed the use of low level radioactive tracers, the use of radioactive materials within well logging activities, disposal of drilling wastes potentially containing radioactive materials, and the question of NORMs that might be released during exploration or production. A draft of this report was reviewed by ESR.

2.64 It should be understood that not all field operators in Taranaki use radioactive tracers and not all uses of radioactive tracers relate to fracturing. Both chemical and radioactive tracers can be an integral part of a conventional well drilling operation, with a range of applications that encompass, for example, demonstration of well integrity, the accurate placement of down-well equipment, tracking drilling muds during drilling operations, and flow testing.

2.65 The Council has been seeking and receiving advice and information from the appropriate specialist and regulatory agencies since 1995 on matters relating to radioactivity and hydrocarbon exploration and production in the Taranaki region. More recently it has undertaken a range of sampling and analytical investigations of its own accord.

2.66 A consistent theme runs through all information the Council has accessed. In summary:

- The Council has sought and received assurances at all points, from the competent statutory authorities and experts, that the use and management of radioactive materials within the hydrocarbon exploration and production sector as established in Taranaki is lawful, and is not harmful to human health.

- The Council has sought and received assurances at all points, from the competent statutory authority and expert body, that the release of any NORMs during hydrocarbon exploration and production as established in Taranaki is not harmful to human health.

- The Council has undertaken its own surveys of produced fluids and soil levels at landfarming sites, to ensure from its own direct measurement that the release of radioactive materials from these sources is not harmful to human health. Measurements have confirmed that this is indeed the case; and indeed neither

radioactive tracers as used in hydraulic fracturing nor NORMs that are present in Taranaki fields are 'radioactive' in terms of statutory definitions, and indeed they contain levels of radioactivity that are orders of magnitude below those at which controls are required.

- The Council has been repeatedly advised by the appropriate competent authorities and has repeatedly found on its own account, that the levels of radioactivity associated with these activities are comparable to normal, everyday exposure for an average person.

- The determinations made by GNS and the National Radiation Laboratory in 1995 are worth re-iterating:

  'I find it very difficult to conceive of a credible concern for the health of the general public in the vicinity of a natural gas field'… 'radon levels in New Zealand do not constitute a health risk. The level is lower than the world average and we have no areas of elevated radon concentrations.'

2.67 In summary, the Council finds no evidence of a health or environmental issue arising from the use of radioactive tracers, the use of radioactive materials within well logging activities, disposal of drilling wastes potentially containing radioactive materials, or the release of NORMs during exploration or production.

2.68 **Attached** as Appendix 9 is a copy of the Council's report: Taranaki Regional Council, 2013. Radioactivity in hydrocarbon exploration (including fracturing activities).

Deepwell injection

2.69 Deepwell injection ("**DWI**") is a liquid waste disposal technology for the disposal of fluids (mainly saline produced water) that has been brought to the surface with hydrocarbons as part of hydrocarbon production operations. The DWI process uses specially designed injection wells to pump liquid waste into deep geological formations or confined saline aquifers. The receiving formations generally contain water that is too saline to have any potential use. Overlying geological seals mitigate against any potential migration of injected wastes into shallow freshwater aquifers.

2.70 In Taranaki contaminants disposed of by DWI are predominantly produced water, but may also include drilling fluids, contaminated

stormwater, hydraulic fracturing return fluids and production sludges. DWI provides an alternative to surface disposal of such fluids.

2.71 The main potential environmental effect of discharging fluids by DWI is the contamination of freshwater aquifers during or following discharge, due to leakage into non-target zones. These potential risks can be adequately managed by the proper assessment, design, operation, control and monitoring of DWI activities. Appropriately engineered technology and site specific mathematical modelling are typically combined at the planning stage of a disposal well to ensure that fluids will be contained within the intended geological disposal interval. These issues are addressed during the assessment of resource consent applications and the setting of appropriate conditions to avoid, remedy or mitigate any adverse environmental effects.

2.72 It should be noted that the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 also apply to DWI wells as well as exploration and production wells. The High Hazards Unit within MBIE therefore has a key role in ensuring well integrity in respect of DWI wells. The TRC has also always required resource consents under the RMA.

2.73 International standards are adopted in Taranaki for the construction of disposal wells. As part of the resource consent application process for DWI activities, applicants are required to submit information that details both the design and construction specifications of the injection well or wells that illustrate well integrity and the isolation of the well bore from surrounding formations. Conditions on consents typically require injection well design and construction details to be provided, along with details of injection pressure and rate and the fluids sampled from the injection zone. Monitoring of the injected wastes for maximum and mean concentrations of contaminants is required with the records made available to the Council.

2.74 There is clearly duplication of effort here in respect of well integrity.

2.75 Produced waters have been disposed of by DWI in Taranaki since the development of the Kapuni Field in 1970. Currently there are 20 resource consents for DWI in Taranaki but not all are exercised all of the time. At the time of writing there were nine active consents for DWI. All DWI consents are subject to tailored compliance monitoring programmes and reported to the Council and the Taranaki public. Monitoring includes inspection of the injection well, injection well

monitoring equipment and injection logs as well as spot sampling of the injectate.

2.76 DWI consent holders consistently achieve a high level of environmental performance and compliance with the resource consent exercised.

2.77 **Attached** as Appendix 10 are two compliance monitoring reports for deepwell injection activities. The associated resource consents and their conditions are included within these reports.

2.78 In 2012 the TRC commissioned GNS Science to review regulation of DWI under the RMA. Of particular interest was a review of overseas regulatory environments to ensure that the TRC programme is consistent with international best practice.

2.79 The review looked at programmes run in the US by the US Environmental Protection Agency and programmes run by agencies in two of the largest hydrocarbon producing provinces of Canada: Alberta and British Columbia. The review found that most of the regulatory requirements of the agencies in the USA and Canada relevant to DWI discharges are already incorporated in existing or proposed TRC consent conditions. Two areas were identified where TRC consent conditions could be 'slightly strengthened' to provide better protection for groundwater resources. These recommendations have been implemented.

2.80 **Attached** as Appendix 11 is a copy of the report: Zemansky, G. Review of regulation of deep well injection under the Resource Management Act. GNS Science Consultancy Report 2012/200, February 2013.

Landfarming

2.81 Landfarming is the process of spreading hydrocarbon drilling by-products and wastes onto land, incorporating the waste into the soil, and then re-sowing the area in pasture or crop to allow natural bioremediation to occur as various soil processes biodegrade, transform and assimilate the waste.

2.82 Typical steps used for the landfarming of drilling wastes are:

- Transporting the waste from well sites by truck (cuttings) or tanker (liquids) to the landfarming site where it may be discharged directly to land or placed in a storage facility.

- Preparing the landfarming area by scraping back and stockpiling existing pasture/topsoil and levelling uneven ground.
- Transferring the waste (possibly after blending with other waste to reduce contaminant concentrations) to the prepared area by excavator and truck and spreading with a bulldozer. Liquids may be discharged by tanker or a spray system.
- After allowing the waste to dry sufficiently, incorporating the waste into the soil, typically to a depth of 250mm, by tilling the soil with rotary harrows.
- Re-spreading the stockpiled topsoil or spreading imported soil to aid stability of the soil surface and assist in pasture establishment.
- Re-establishing vegetation, whether pasture or crop, at a suitable time of year. Fertiliser may be applied at this time.

2.83 Land treatment of drilling wastes through landfarming has been in place in Taranaki for a decade or more. Many of the landfarms in Taranaki have been on poorer, sandy, coastal soils which generally are not capable of sustaining good pasture and are prone to erosion. In these situations landfarming will improve the texture of the receiving soil and make it less erosion prone and more productive. Landfarming in Taranaki is not restricted to coastal soils, however, and is also carried out on heavier, volcanic-ash derived silty and clayey soils.

2.84 Drilling by-products and wastes disposed of by this method generally consist very substantially of rock cuttings removed by drilling through geological formations, but also drilling fluids (drilling mud) adhering to cuttings, unwanted or non-recyclable drilling fluids, oily wastes such as oil formation sands, and sludges removed from tanks and separators.

2.85 The main environmental effects to be managed are potential effects on soil health and toxicity and groundwater quality.

2.86 Currently in Taranaki, there are eight sites actively being used for landfarming drilling wastes or ready to begin taking drilling wastes. Six sites are in coastal locations and two are on inland sites. A further four sites are no longer taking wastes but still hold resource consents are still being monitored by the Council.

2.87 All sites are required to have resource consents to discharge contaminants to land. These consents have a variety of consent conditions, some common across sites and some tailored to the

particular site, to control the environmental effects of the activities. Included are controls on contaminant concentrations, contaminant loading rates and effects on water and groundwater. Sampling of soil and water is required of the consent holder to monitor contaminant inputs and the effects and progress of the landfarming. The TRC also carries out regular compliance monitoring which is documented in annual reports for each site and which are presented to the Council and the public.

2.88 As far as input standards are concerned, consent conditions typically impose requirements to:

(a) prepare a management plan containing detailed requirements around notification procedures, the receipt and stockpiling of drilling by-products and wastes onto the site, the management of stormwater from the stockpiling area, methods for mixing and testing different waste types, site preparation, procedures for landfarming itself, procedures for sowing landfarmed areas, post-landfarming management, monitoring and site reinstatement, contingency procedures, sampling regime and methodology and control of site access;

(b) notify the Council within 48 hours prior to waste being brought on to the site for stockpile and prior to application of waste to land;

(c) sample each type of waste for total petroleum hydrocarbons, BTEX, polycyclic hydrocarbons (PAHs) and chloride, nitrogen, pH, potassium and sodium; and

(d) keep records.

2.89 There are then controls on hydrocarbon loading rates through a combination of concentrations and mixing ratios (defined by depths of applied waste and cultivation depth), and a suite of off-site and end-point conditions to provide environmental protection and protect subsequent use of the land that might involve pastoral usage.

2.90 Consent conditions include requirements to comply with certain national guidelines and standards. With regard to the concentration of metals in the soil, consent conditions require compliance with the guidelines for heavy metals in soil set out in Table 7.1 of the 'Guidelines for the safe application of biosolids to land in New Zealand' (Ministry for the Environment and New Zealand Water and Wastes Association, 2003).

2.91 Conditions also require that certain hydrocarbon constituents do not exceed standards set out in the 'Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand' (Ministry for the Environment, 1999). A further condition stipulates that the consent cannot be surrendered until the standards referred to in the consent are met.

2.92 As previously noted, consents are regularly monitored by the Council for compliance with consent conditions and reported to the Council (and the public) annually.

2.93 The Council addresses all instances of non-compliance and takes appropriate action. In most cases however, companies undertaking landfarming activities in Taranaki have demonstrated high levels of environmental performance and compliance with consent conditions.

2.94 Monitoring undertaken by the Council shows no significant adverse environmental effects from landfarming activities.

2.95 **Attached** as Appendix 12 are two annual compliance monitoring reports on consented landfarming activities in Taranaki. The associated resource consents and their conditions are included within these reports.

2.96 The Council's management of landfarming activities is based on international best practice and has evolved as experience has been gained with Taranaki conditions. The Council undertakes regular reviews of its management approaches for landfarming and updates its guidelines and consenting conditions as best practice evolves. These have involved on-site visits and regular contact with relevant overseas jurisdictions as well as the use of specialised experts external to the Council.

2.97 Two of the most recent reviews were carried out in 2013 by Pattle Delamore Partners Ltd and by Dr D Edmeades of agKnowledge Ltd. The Council commissioned Pattle Delamore Ltd to undertake a review of resource consent conditions imposed by the Council on landfarming, and compliance monitoring results for several Taranaki landfarming sites. The broad intent of the review was to determine whether landfarming is an environmentally viable activity and, if so, whether the process is being managed appropriately by the Council. In summary **the review concluded that landfarming is a valid and environmentally acceptable means of waste treatment, with appropriate controls.** In general, the intent and nature of the controls

imposed by the Council were found to be appropriate. The overall conclusion of this review was that there is no reason why landfarming should not continue, subject to controls being imposed by means of consent conditions appropriate to each site and the waste being handled. As previously noted, monitoring by the Council shows no significant adverse environmental effects from landfarming activities in Taranaki. Recommendations for amendments to incorporate latest international best practice have been implemented.

2.98 The Council commissioned Dr D Edmeades of agKnowledge Ltd to determine whether land used for landfarming activities are 'fit for purpose', in this case fit for pastoral farming and in particular, dairying. As required by resource consent conditions, regular soil samples were collected and analysed during the disposal process. These results were summarised and examined relative to the permitted limits for the various potential contaminants. The completed landfarming sites were visited and the pasture and soils inspected. Soil and pasture samples were collected and analysed for all potential contaminants. These results were compared to the properties of normal New Zealand pastoral soils.

2.99 The **Edmeades review concluded these modified soils are 'fit for purpose'.** The concentrations of nutrients (macro and micro), heavy metals and soluble salts in these soils and pasture are similar to normal New Zealand soils. The form of barium present is as environmentally benign barite, and there is no evidence of accumulation of petrochemical residues. The study found that the process of landfarming these otherwise very poor soils, together with appropriate management (irrigation, fertiliser and improved pastures) has increased the agronomic value of the land from about $3,000 - $5,000/ha to $30,000 - $40,000/ha, that is, a 10-fold increase in agronomic value.

2.100 **Attached** as Appendix 13 are the reports of Pattle Delamore Partners Ltd and Dr D Edmeades of agKnowledge Ltd.

2.101 In June 2013, Fonterra announced it would no longer collect milk from new landfarming sites but would continue to collect milk from currently consented landfarming sites. Fonterra acknowledged that it had no food safety concerns with milk produced on landfarming sites and that none of its testing had shown any contamination of milk from landfarming activities. Instead it cited the cost of monitoring as the reason it would no longer collect milk from new landfarming sites. The

Council notes that Fonterra's decision is not based on any scientific evidence of adverse environmental or human health effects.

Conclusions: Taranaki experience

2.102 In summary, the oil and gas industry in Taranaki is subject to a well-established and comprehensive regime of regulation, monitoring, inspection and enforcement by the TRC in carrying out its functions and responsibilities under the RMA. The resource consent process now also applies specifically to fracking operations, albeit resulting in a substantial duplication with MBIE regulatory imposts. Despite the relatively large number of oil and gas wells constructed and operated in Taranaki (still a very small level of activity by international comparisons) there is no evidence of significant adverse environmental effects on water, air, land or public health. The few accidents or incidents which have occurred have been subject to regulatory action and remedial measures – with no evidence of long term adverse environmental effects.

2.103 The results of the Council's monitoring to date together with the various studies, investigations and reviews carried out in Taranaki, (which have included drawing on international experience), show that oil and gas operations can be carried out safely and with negligible environmental impacts and risks, provided best oilfield practices are applied and enforced. The TRC has also considered it important to avoid duplication of regulatory roles between the Council and central government agencies responsible for health and safety.

2.104 The TRC regulatory approach is based on a framework of continuous improvement including maintaining a good understanding of best practice internationally. It may be said that no other regional councils have had the reason or opportunity to build up a body of practical experience and expertise similar to that of the TRC. This issue can be readily addressed by ongoing administrative mechanisms for improved cooperation and sharing of relevant regulatory experience and expertise between Councils.

3. CURRENT REGULATORY REQUIREMENTS

Crown Minerals Act

3.1 Under the Crown Minerals Act 1991 ("**CMA**"), the Minister of Energy gives approval for hydrocarbon exploration and production work programmes. Such approval can be withheld if a programme (including fracking) is considered contrary to recognised good exploration or mining practice. Good industry practice is now defined (Crown Minerals Amendment Bill, Section 8) as meaning "technically competent" and at a level of "diligence and prudence reasonably and ordinarily exercised by experienced operators".

3.2 From an environmental perspective the new Crown Minerals legislation has broadened and strengthened the considerations which the Minister is able to apply to decision-making in relation to granting permits or in regularly reviewing performance. There is now a legal mechanism for specific inquiry into the environmental risk, management credentials and capabilities of the operator as well as an annual review of performance.

3.3 Prior to the recent amendment to the Act the responsible Ministry, the Ministry of Business, Innovation and Employment (MBIE) approached the requirement for "good practice" as generally relating to efficient use of the mineral resources (to avoid wastage or contamination of the resource) rather than health and safety or environmental considerations. Regulation of environmental matters is the responsibility of local authorities under the RMA. Some MBIE requirements do have potential flow-on environmental impacts in practice but these have historically not been assessed at the permit granting stage.

3.4 In the above context it is important to note that the recent Crown Minerals Amendment Bill (passed in April 2013) considerably strengthens aspects of the Minster's evaluation of the qualification and credentials of a potential minerals permit holder to include potential consideration of relevant health, safety and environmental issues at the permit granting stage.

3.5 As noted above, in granting a permit the Minister must be satisfied that the proposed work programme is "consistent with good industry practice". This does not include "any aspect of the activity regulated under environmental legislation" (Section 29A Crown Minerals Amendment Bill). Thus responsibility for environmental risk assessment

and regulation remains clearly with regional and local consent authorities who administer the RMA.

3.6 However, the Minister must also now be satisfied that for major ("**Tier 1**") permits the permit operator has "... the capability and systems likely to be required to meet **the health and safety and environmental requirements** of all specified Acts"... (Section 29A2(c)).

3.7 Importantly, the Minister now also has the power to "seek the views of any other regulatory agency" for the purposes of making a decision (Section 29A(3).

3.8 Furthermore, annual "reviews" of Tier 1 permits may now also be undertaken by the Chief Executive of MBIE. Any regulatory agency – including "consent authorities" – who have "regulatory oversight" of the activities under the permit must be invited to any such review.

Petroleum Exploration and Extraction Regulations

3.9 The Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 ("**Regulations**" or "**Petroleum Regulations**") define a range of specific duties and requirements related to the safety of well drilling operations. These include the proper design, construction and operation of wells to ensure well integrity, including fracking operations. Important changes to the earlier 1999 regulations were made in early 2013 and have applied since June 2013.

3.10 The Regulations contain detailed, often prescriptive, requirements for design, construction maintenance, suspension and abandonment of petroleum operations and related well-drilling operations including fracking. The Regulations, which were historically administered by the Department of Labour, are now administered by a specialist High Hazards Unit in the MBIE. This new unit has specific responsibilities for enforcement of health and safety requirements in the mining, geothermal and petroleum industries.

3.11 A number of detailed regulations (particularly in Part 6) are specifically relevant to the critical aspect of well integrity. Ensuring well integrity is a key element in ensuring the avoidance of water pollution arising from fracking operations.

3.12 As noted above, from June 2013 new revised health and safety regulations apply to oil and gas operations.

3.13 New requirements (which also apply to fracking operations) include:

(a) Operators of larger, higher risk oil and gas installations (on and offshore) will be required to prepare a "safety case" to be submitted and accepted by MBIE before work can commence.

(b) Independent expert scrutiny of safety cases will be undertaken by consultants appointed to advise MBIE.

(c) Operators of smaller scale, lower risk onshore installations will be required to prepare an HSE "overview" in lieu of a "safety case".

(d) The well examiner scheme.

3.14 Much of this work is highly specialised and is likely to involve the contracting of specialist international expertise by the High Hazards Unit in MBIE from time to time as required.

3.15 These requirements add important new regulatory safeguards, particularly in relation to detailed assessment of well construction and integrity. While the primary focus is on health and safety of workers the emphasis on independent scrutiny of well integrity is also directly relevant to minimising environmental risks, particularly water contamination.

3.16 The new regulatory regime will focus on the whole life cycle of wells, to ensure that wells are designed, modified, commissioned, constructed, equipped, operated, maintained, suspended and abandoned in a way that ensures operators reduce the risks to a level that is as low as reasonably practicable.

3.17 In addition, all operators will be required to implement arrangements for independent and competent persons to examine the design, construction and maintenance of all wells within their control under a well examiner scheme. The issue of long term responsibility for environmental problems emerging following well abandonment requires very careful consideration to ensure future environmental liabilities do not fall on regional or local government.

3.18 The new requirements are administered by the High Hazards Unit within MBIE. While a focus of these new requirements is primarily to prevent accidents or blow-outs leading to health and safety risks and major environmental accidents the improvements foreshadowed to regulation of well integrity directly relevant to reducing fracking risks to water quality.

3.19 The importance of well integrity in avoiding adverse environmental outcomes cannot be over emphasized. A key finding of the United Kingdom Royal Society report is that well integrity is the highest priority for environmental protection, as faulty wells are more likely to be the cause of contamination.

3.20 It is therefore important that the regulatory framework for well integrity is fit for purpose and does not involve overlap and duplication. In TRC's view, there are considerable benefits associated with removing the duplication that currently exists for regulating well integrity between MBIE and regional councils in favour of a central location for this specialist function. Among other things, this will improve efficiency and consistency, increase certainty, avoid duplication of limited technical expertise and reduce cost. This is a key area where legal clarification is required as between the requirements of the Health and Safety in Employment Act and the Resource Management Act. This is discussed further in later sections of this submission.

Hazardous Substances and New Organisms Act 1996 (HSNO)

3.21 Many fluids and additives use in wellsite activities, including fracking, are everyday substances that require no specific controls beyond RMA regulation of discharge. However, some are deemed l hazardous substances, and all aspects of their use are therefore subject to HSNO requirements administered by the Environmental Protection Agency ("**EPA**") and the High Hazards Unit of MBIE.

3.22 Approvals for any aspect of the use of any hazardous substance are the responsibility of the EPA.

3.23 HSNO sets out obligations for handling storage, use and spill contingencies for fracking fluids. All on site operations are subject to regulations and HSNO requirements.

3.24 The purpose of HSNO requirements are to avoid or minimise risks to human health and the environment associated with the storage or use of hazardous substances, including chemicals used in fracking at well sites.

3.25 The operator of a well site using hazardous substances while undertaking fracking (or at any other time) must ensure compliance with a wide range of HSNO requirements including maintaining an onsite register of all hazardous chemicals stored on site, separation

distances between storage tanks, secondary and tertiary containment and spill contingency plans.

3.26 Compliance and enforcement of any aspect of the use of hazardous substances (including transport, storage, use and disposal) in a workplace such as a wellsite, is the responsibility of MBIE.

3.27 Safety Data Sheets for each compound or chemical held on site will in most cases provide detailed information on composition (ingredients and proportions), for inspection.

3.28 It is important to note that the proportion of any particular hazardous substance in a fracking fluid mixture will be greatly diluted, typically well below 1% of product concentrations upon injection and even less upon return to the surface. When diluted to this extent some hazardous substances may no longer pose any potential environmental risk. More specifically, a substance might be deemed a hazardous substance while present on a site in concentrated form and bulk volume, but following dilution for use might no longer meet concentration thresholds to be classified as a "hazardous substance". The mere presence of such a substance within a return flow does not mean that the flow can be deemed to contain "hazardous substances" in any meaningful or legal use of the term, just as any urban stormwater flow containing any number of constituents that in bulk and in concentrated form are hazardous substances but stormwater is not deemed a hazardous substance for purposes of statutory control.

3.29 The flow back (return fluids) are classified as a waste product. Because of their indeterminate and highly variable constituents they are not captured by HSNO legislation, and HSNO compliance and enforcement regimes do not apply. However, RMA controls are in place at all wellsites to address potential environmental effects of such fluids e.g. bunding, storage vessels, contingency planning.

3.30 It is also important to note that any hazardous substances that might be used in fracking do not require a specific EPA approval for use in fracking.

3.31 In addition to HSNO obligations, the resource consent process for fracking operations under the RMA can require disclosure of all fracking compounds intended for use, as part of the consent application. Resource consent conditions can also require confirmation, following fracking, of all volumes and compounds

actually used, as well as requiring the collection and return of fracturing fluid samples for independent analysis.

Resource Management Act 1991 (RMA)

3.32 The RMA is the means by which the potential environmental effects of fracking can be controlled and managed. Regulatory responsibility for granting resource consents authorising oil and gas, including fracking operations is split between Regional Councils (water, land and air discharges) and District Councils (land use).

3.33 In Taranaki, the drilling of wells and bores is regulated under the Regional Fresh Water Plan 2001. Rule 46 of the Regional Fresh Water Plan permits the drilling or construction of a well or bore subject to conditions. One of the conditions is that all bores for hydrocarbon exploration and extraction must be cased and sealed to prevent the potential for aquifer cross-contamination or leakage from the surface. If the conditions of Rule 46 cannot be met a resource consent for the drilling activity will be required.

3.34 Other rules in the Fresh Water Plan regulate other aspects of oil and gas operations (discharges to land and water, water takes, use of river and lake beds etc).

3.35 The Taranaki Regional Council regulates and monitors all aerial emissions, including any potential fugitive emissions from wellsites.

3.36 In Taranaki, since July 2011 TRC has required an operator to obtain a resource consent for fracking operations. This requirement for a resource consent is based on a combination of Section 15(d) of the RMA (covering the discharge of fracking fluids to deep hydrocarbon reservoirs) and a general rule in the Council's Fresh Water Plan (Rule 44) that allows the Council to process discharge applications as a "discretionary activity" under the RMA.

3.37 The requirement to obtain resource consent was adopted in the face of considerable legal uncertainty arising from the proper relationship between the Health and Safety in Employment Petroleum Regulations and the RMA as well as the specific wording of the relevant section of the RMA itself. In this context the PCE had no authority from TRC to release the legal advice on this latter point received by TRC. This legal opinion did not definitively state that resource consent for discharge of fracking fluids to ground should be required as incorrectly reported in the PCE's interim report. From the TRC's viewpoint the main reason

for requiring a consent is to comply with a potential legal technicality rather than responding to a so-called 'gap' in the RMA. As discussed in later sections of this report this technical legal issue requires legislative clarification as it clearly has important consequences for both regional councils and industry.

3.38 Fracking activities had been undertaken and regulated prior to 2011as part of approved oil and gas operations without the specific need for resource consent. This was due to a number of factors:

(a) The considerable depth of the discharge of contaminants from fracking (as opposed to the levels of groundwater aquifers);

(b) The low potential effect due to the diluted nature of fracking chemicals and the presence of substantial thicknesses and multiple layers of low permeability geologic formations which act as seals to trap the fluids in place; and

(c) The temporary nature of the discharge with a high percentage returned to the surface as flow back fluids; and

(d) The not unreasonable reliance on the administration of the Petroleum Regulations to address the critically important matter of well integrity as the key environmental risk factor.

3.39 The Council's extensive monitoring of oil and gas well sites throughout Taranaki which involved routine ongoing inspections of all producing well sites, including those where fracking had occurred, had not revealed any adverse environmental effect from fracking.

3.40 Operations still required resource consent for a range of activities associated with fracking, including:

(a) The disposal of drilling wastes and production water (which includes fracking fluids) via land farm disposal or deep well injection; and

(b) Resource consents to flare gas at a well site.

3.41 An application for resource consent to discharge fracking fluids at depth under the RMA must be accompanied by an Assessment of Environmental Effects ("**AEE**") report. The AEE is required to present such detail as corresponds with the scale and significance of the effects (Section 88(2)). Section 88 and the Fourth Schedule of the RMA set out what should be included in the AEE.

3.42 An example of a comprehensive AEE for fracking operations is the report prepared by Shell Todd Oil Services Ltd in support of fracking discharge applications at four sites in the Kapuni Field (Shell Todd Oil Services Limited, 2012. Assessment of environmental effects for hydraulic fracturing stimulation of four existing wellsites within the Kapuni Field. A copy of this report can be found on the Council's website).

3.43 In terms of setting limits of fracking fluid discharge consents the Regional Council is able to set such limits as it considers appropriate, without having to take into account section 142 of HSNO because there are no Environmental Exposure Limits (EELs) established by the EPA for oil and gas substances.

3.44 Consent conditions can be imposed on a resource consent based on the hydro geologic risks identified in the AEE or subsequent expert evaluations on behalf of the Council. The four key risks:

(a) Leakage due to defective well installation/operation;

(b) Leakage through geologic media;

(c) Leakage or improper handling of chemicals or wastewaters at the drilling site; and

(d) Well blow outs;

are all able to be regulated by consent conditions.

3.45 Conditions can also require a water quality monitoring programme and reporting to establish baseline and post-fracking water quality data to confirm that adverse environmental effects on water do not occur.

3.46 Other conditions can include:

(a) Measures to ensure that fracking discharges will not affect the integrity of the well so that adverse effects associated with unplanned escape of fracking fluids from the well or associated equipment are avoided.

(b) Comprehensive pre-fracking discharge reports prepared by the operator to enable checking and verification of compliance with conditions and consistency with information provided in the application and AEE.

(c) Post-fracking reports to confirm details of the activity are consistent with the application and AEE and that the discharge complies with the conditions of consent. This report is to provide essential information that discharged material remains in the fracture interval or is otherwise accounted for and did not and will not enter fresh water. The report includes requirements in relation to modelling mitigation measures, characteristics of geology above the discharge point to the surface, and other technical data related to the discharge.

(d) Sampling locations to test compliance.

3.47 Operators can also be required to adopt the best practicable option to prevent adverse effects by ensuring:

(a) The discharge is contained within the fracture interval;

(b) Regular reviews are undertaken of preventative and mitigation measures adopted to ensure the discharge does not cause adverse environmental effects; and

(c) Regular reviews of the chemicals used are undertaken with a view to reducing toxicity of chemicals used.

3.48 Refer to Appendix 3 for a recent set of conditions which TRC has imposed on a fracking consent.

3.49 District council consents cover a range of land use considerations for wellsites and landfarming waste disposal areas. The wellsite drilling and testing land use consent considerations generally include the hydraulic fracturing activity as part of wellsite operations and a separate consent is not required.

3.50 With regard to wellsites, district council land use considerations include cultural and archaeological effects, noise, vibration, light, dust, vehicle movements, hazardous substances management, spill or emergency management, waste management, landscaping, flaring and decommissioning and site restoration.

3.51 The environmental effects considered by district councils in land use consents for landfarming waste disposal sites (including hydraulic fracturing return fluids) include land management (e.g. revegetation periods, land stabilisation, vehicle site access standards), cultural and archaeological effects and dust effects,

3.52 District councils in Taranaki have noted that the consideration of hydraulic fracturing operations at a wellsite represent very limited further consideration of environmental effects than for normal drilling operations. The type of environmental concerns addressed by district councils for hydraulic fracturing generally fall within the environmental effect envelopes established for normal drilling and well testing operations. Considerations are also similar for waste disposal consents.

4. INTERIM FINDINGS OF PARLIAMENTARY COMMISSIONER

4.1 The interim report of the PCE identifies four key aspects of oil and gas production that are "key to protecting the environment" (PCE, page 6). In addition the report comments on well abandonment.

Choosing where to drill

4.2 The first of these aspects is "choosing where to drill". The PCE notes that the grant of a permit for drilling a petroleum well under the CMA "does not require an assessment of environmental risks". While that is correct in terms of the CMA permit, that does not mean that a drilling operation can commence without addressing environmental risks. This is because controls will now be imposed in plans or resource consent will now be required for the drilling operation from the local authorities under the RMA. For example, the New Plymouth District Plan requires a discretionary resource consent for the erection of well site structures and buildings within 20 metres of fault lines identified in the district plan. An operator will therefore always need to bear in mind when choosing a location to drill that resource consents will be needed. An AEE will be required to be filed with any consent application.

4.3 If an operator were to select a drilling location which involves fracking at a highly sensitive location, where potential environmental risks were particularly high, this would need to be identified and discussed in the AEE supporting consent applications. If the safeguards or other mitigation measures were considered insufficient or inadequate, consent would be granted only subject to stringent conditions, or declined.

4.4 Thus the selection of a drilling location by an experienced operator is most unlikely to be made solely on the basis of commercial criteria or ease of access. A full environmental impact assessment of a potential drilling location will be necessary to secure the subsequent resource consents which may affect land or water.

4.5 In terms of any potential for seismic risk, the AEE would need to provide relevant information on this aspect for consideration and review by local consent authorities, who could refer any technical questions to relevant independent experts for evaluation before granting consents. In this context, the TRC has commissioned a study by GNS of the effects of fracking on seismicity in the Taranaki region (see Appendix 6). The report concluded that:

(a) There is no evidence that fracking in Taranaki has had any observable effect on national earthquake activity;

(b) It is unlikely that fracking would induce earthquakes in the Taranaki region that would have a significant effect.

It is significant to note that these findings in respect of Taranaki are similar to the findings of the Royal Society report in the United Kingdom ("**UK**") (Page 4) which states:

> *"there is an emerging consensus that the magnitude of seismicity induced by fracking would be felt by few people and result in negligible, if any, surface impacts."*

4.6 Finally, the relevant provisions of HSNO will apply to use, storage and handling of any hazardous chemicals on the drilling site selected. Thus if the site is for some reason particularly susceptible to higher environmental risks in the event of spillage this can be incorporated in HSNO contingency plan requirements as well as covered by resource consent conditions applicable to the selected site.

4.7 The recent amendment to the CMA also allows the Minister to assess the environmental capabilities and performance attributes of the operator – and, if necessary, impose suitable conditions on Ministerial consent or in the annual review process.

4.8 It is also noted that the safety case and well integrity scheme requirements will mean site factors are taken into account for installations, which includes wells. The scope of the Petroleum Regulations is such that an assessment of seismic risk and the adoption of appropriate well designs could be included under the well examination scheme. Further comment on these matters is made in section 6 of this submission.

Well design

4.9 The second key risk activity identified by the PCE (PCE, page 55) is "designing and constructing the well" (PCE, page 56). This is consistent with the Royal Society report for shale gas fracking in the UK which states (page 4): "ensuring well integrity must remain the highest priority to prevent contamination".

4.10 The PCE notes that design and construction of the well is "critical in preventing environmental damage". The primary way this is achieved is through the requirements of the Petroleum Exploration and

Extraction Regulations promulgated under the Health and Safety in Employment Act 1992 ("**HSE**").

4.11 The PCE notes that because well integrity is critical for protecting the environment as well as protecting workers the regulations "do provide some environmental protection, although it is incidental to their purpose".

4.12 It is very difficult to ascertain what unregulated risks to the environment arise from a regulatory approach to well integrity that has as its central purpose ensuring the integrity of well design and construction so as to avoid any well blowout or accident (including leakage of drilling fluids or wastes). In this context environmental protection is not accurately described as "incidental" to workplace safety, it is an essential corollary of achieving safety. The requirements to protect workers from lack of well integrity fulfil an important dual purpose in also protecting the environment.

4.13 The recent strengthening of work place safety involving requirements in relation to independent "safety case" review of drilling operations (including fracking) and the well examiner scheme, will add an important additional level of expert scrutiny and review to well design and operation prior to well drilling commencing and throughout the entire life cycle of the well including its subsequent operation, maintenance, modification, suspension and abandonment.

4.14 Currently, in considering resource consents for fracking local consent authorities should be legally entitled to rely on the review of well integrity undertaken under the relevant Petroleum Regulations.

4.15 It is clearly not intended that local authorities should be obliged to duplicate a review of well integrity and be required to undertake their own independent technical review of well integrity and throughout the life cycle of the well.

4.16 There is no evidence from the numerous wells drilled in Taranaki (on and off shore) that local authority reliance on the well integrity regulations now administered by MBIE has been misplaced or has led to any serious compromising of either workplace safety or environmental protection. Of the more than 600 wells drilled there has been only one well blowout and that was before the Petroleum Regulations were in place. That noted, the Council has previously noted the need for better central government resourcing, not so

much for regulatory systems but for on the ground monitoring and enforcement of the regulations that are already in place.

4.17 The Royal Society report notes (page 27) that there would be advantages in the UK regulatory system by widening regulations "so that well integrity is also considered from an environmental perspective". In principle, improved integration of health and safety with environmental considerations would mean an earlier input for local consent authorities in relation to regulatory approval of the well integrity.

4.18 With respect to fracking operations there may be advantages, in terms of well integrity review, in having a mechanism for input from the local authorities who are ultimately responsible for environmental issues.

Well abandonment

4.19 Well abandonment can also pose environmental risks depending on best operational practice. In principle the entire life cycle of a well is best regulated under one statutory umbrella (the HSE and associated Petroleum Regulations).

4.20 However, there is a need to clarify responsibilities and develop effective mechanisms to deal effectively with 'legacy' issues associated with well abandonment, particularly with respect to older wells that pre-date modern standards and regulation and which pose the greatest risk.

4.21 As previously noted, the MBIE is primarily responsible for ensuring well integrity and proper standards of well abandonment as part of the requirements of the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 (see section 3). Issues of responsibility and liability can arise if abandoned wells begin to cause environmental or other problems through degradation over time or failure, and the site is no longer a workplace.

4.22 Furthermore, previous employers associated with abandoned wells may no longer be in existence, meaning liability must be carried by others.

4.23 In the absence of a party responsible for an abandoned well, the enforcement tools under the RMA could be used to require the current owner or occupier of the land on which the problem exists, to

undertake remedial action. However, there are reasonable arguments against taking this course of action. Land owners and occupiers are likely to have taken ownership and/or residence on the property without any knowledge of past petroleum operations. The cost of addressing well abandonment problems and the likely limited financial resources of property owners or occupiers mean that effectively dealing with well abandonment issues may represent an insurmountable cost for the landowner.

4.24 Currently there is no clear legislative framework through which to resolve these potential 'legacy' issues. However, the Crown is the regulator responsible for ensuring well integrity and that proper well abandonment standards are in place in the first instance. The Crown also owns and controls petroleum resources and derives benefits from their extraction through royalties etc. There are therefore strong arguments that the Crown should assume responsibility for any legacy issues associated with well abandonment. The Crown's legacy role should be made explicit in law and under no circumstances should this become a 'default' local authority responsibility.

4.25 We note that MBIE is currently preparing guidelines to give effect to the goal-based Petroleum Regulations and these include guidelines on well abandonment and the well examination scheme.

Avoiding spills and leaks on the surface

4.26 The PCE's interim report notes that the "most likely cause of contamination of water is spills and leaks occurring at the surface" but also notes that the severity of such incidents is "typically small and easily managed" (PCE, interim report page 50).

4.27 Requirements for the handling of fracking chemicals on a drilling site are set out in HSNO legislation and additional safeguards, including monitoring and reporting, can be incorporated in local council resource consent conditions.

4.28 Recent evaluation of the monitoring of compliance with HSNO requirements by the former Department of Labour indicates that a significant improvement in performance is warranted. For 2012 less than 3% of premises using hazardous substances were inspected for compliance with HSNO requirements (Environmental Protection Authority, 2012. Hazardous substances and new organisms compliance and enforcement: Report on enforcement agency

activities for the year ended 30 June 2012 and intentions for the year ending 30 June 2013. Report to the Minister for the Environment).

4.29 This contrasts with the inspection/monitoring by TRC which aims to cover each well site at a rate of each 1-2 weeks as well as production stations, waste treatment and disposal sites 4-6 times a year for every facility as well as responding to any complaints. TRC records for the oil and gas sector show annual compliance rates of around 97% compared to HSNO national compliance of around 25%.

4.30 As noted earlier, flow back fluids are generally not subject to HSNO requirements (due to being classified as a waste product). However, their potential effects are still considered by regional councils through discharge rules under the RMA.

4.31 The difference in monitoring requirements and compliance performance suggests a need for major regulatory compliance improvements in relation to HSNO. However, in relation to oil and gas operations in Taranaki the record shows there have been high levels of monitoring and compliance.

Disposing of waste

4.32 Ensuring the treatment and disposal of wastes from fracking operations is the regulatory responsibility of regional and district councils under the RMA.

4.33 The PCE notes (page 60) that there are three main methods used in New Zealand for treatment and disposal of waste from oil and gas operations (including fracking). These methods are: land disposal; deepwell injection; and treatment at industrial waste facilities.

4.34 The PCE does not state any particular concerns in relation to these waste disposal activities.

4.35 As noted in section 2 of this submission, in Taranaki, resource consents are required for the landfarming of solid and semi-solid wastes arising from exploration activities, as a discharge to land. Landfarming is recognised internationally as an effective and environmentally sound manner to treat such wastes, in particular by reducing the hydrocarbon content to acceptable levels. It is a long-standing and well-proven and credible practice, accepted by environmental regulatory authorities throughout the world. The process utilises the natural biodegradation capacity of soil ecology to degrade

hydrocarbons, as happens with any composting or other natural decomposing activity in the natural environment. The key elements are to ensure that initial loadings do not overwhelm the biological activity that is to be utilised, and that any persistent contaminants (e.g. metals) are not applied at rates that would render the site unsuitable for any future land use.

4.36 There are well-established and well-tested guidelines/directives available for reference. For more than 15 years the Council has closely followed Directive 50[1], from the Alberta Energy Resources Conservation Board (formerly the Alberta Energy and Utilities Board), for its consenting and monitoring practice. This guidance is very conservative when applied in the Taranaki context (i.e. it is based on an environment where soils are frozen for 6 months of the year, and soils have minimal organic content and retentive ability, as compared with Taranaki's temperate climate and high biological activity).

4.37 As is the case across all of the Council's regulation of discharges, the Council has from time to time conducted reviews and studies (both internal and external) to ensure that its regulatory management remains current with evolving best practice and to gain the benefit of its comprehensive record of monitoring for compliance and for effects. It is absolutely clear that when there is compliance with consent conditions, any effects are less than minor. Equally importantly, the utilisation of drilling wastes (cuttings and muds) has demonstrable benefits for the rehabilitation of poor quality and erosion-prone coastal pasture lands.

4.38 As noted in section 2 of this submission (under "Landfarming") a recent independent review of landfarming activities in Taranaki and associated regulation by the Council carried out by Pattle Delamore Partners Ltd, has concluded that landfarming is a valid and environmentally acceptable means of treating drilling by-products and wastes, with appropriate controls. Similarly a recent study undertaken by Dr D Edmeades of agKnowledge Ltd has found that soils subject to landfarming in Taranaki are 'fit for purpose', in this case for pastoral farming and particularly dairying, and in fact that the process of landfarming has increased the agronomic value of these otherwise poor soils from about $3,000 - $5,000/ha to $30,000 to $40,000/ha – that is about a 10-fold increase in agronomic value. The

1. Directive 50: Drilling Waste Management, last updated 2 June 2012.

Edmeades' report reinforces the statement we have made in the previous paragraph that correctly undertaken, landfarming is actually a beneficial waste recycling activity as opposed to a waste disposal/dumping activity as some seek to present it.

4.39 The Council is clear that based on the substantial evidence accumulated to date, concerns that have been voiced by some parties over the practice of landfarming lack any basis in fact or reason. It is of concern to the Council that an environmentally beneficial practice is indeed now being constrained because of negative perception.

4.40 In Taranaki, resource consents for deepwell injection are required. Deepwell injection is a waste disposal technology which utilises specifically designed injection wells to pump liquid waste into geologic formations or confined saline aquifers. Overlying geologic seals confine the materials to the receiving formation and prevent the vertical migration of injected water into shallow fresh water aquifers.

4.41 Standards for the construction of disposal wells in Taranaki are generally based on US EPA requirements.

4.42 Resource consents for deepwell injection require an AEE to be submitted by an applicant with the resource consent application.

4.43 Detailed conditions of consent designed to prevent adverse effects on water quality, monitoring and compliance testing are typically required (see Appendix 10).

4.44 In 2012 TRC commissioned GNS to review the regulation of deepwell injection to ensure the Council's regulatory program*me* is consistent with international best practice. GNS found the Council's consent conditions cover many of the important provisions found in the US EPA and Canadian regulatory programs (see Appendix 11).

4.45 The emphasis of regulatory requirements was found by GNS to be on well integrity (page 51). GNS concluded that an "active regulatory program*me* with interagency cooperation and comprehensive requirements is necessary to protect the public interest".

Onsite waste storage, treatment and disposal

4.46 In Taranaki oil and gas exploration and production sites typically contain flare pits, skimmer pits and waste pits for the storage, treatment and disposal of wastes generated onsite. In cases where

the waste is stored and treated prior to discharge to surface or groundwater, the discharges are authorised by resource consent and monitored for compliance with consent conditions. Rates of compliance are very high and adverse environmental effects are minor. Any discharges from the base of flare pits, skimmer pits and onsite waste pits to groundwater are also required to be authorised by consent or otherwise would be in breach of the RMA.

4.47 The Council is fully aware that the integrity of the pit lining is critical to preventing unauthorised discharges. The Council regularly reminds the industry that the base and walls of waste pits must be impermeable or any discharges otherwise authorised, to comply with the requirements of the RMA. Companies in Taranaki have generally had clay-lined pits designed to prevent contaminant loses from the base of these pits. These have now been or are being upgraded to synthetic-lined facilities as part of continuous improvement programmes and to provide added assurance on RMA compliance.

4.48 The Council regularly inspects exploration and production sites to ensure the industry is complying with its obligations under the RMA. In a small number of cases, for example at Waitui and Turangi B wellsites, the Council has found inadequate pit linings (notably in the Turangi B case this involved the failure of a synthetic liner). Further investigations at these sites have shown only minor inconsequential environmental effects.

4.49 The one case where more significant discharges have occurred from pits at the Kapuni site has been discussed in section 2 of this submission and as stated there, the discharges are the result of past legacy issues no longer occurring in Taranaki, the contamination is confined to a relatively small area of the site and is being remediated.

5. THE CASE FOR FUTURE REGULATORY CHANGE

5.1 The PCE interim findings included three conclusions on government oversight and regulation. Notably, the interim report does not put these conclusions into the broader context noted above. The PCE findings are set out below and the TRC's response to those findings summarised.

First PCE finding – Importance of oversight due to complex and fragmented system

5.2 The first finding is that "the system is complex and fragmented making oversight extremely important". The PCE described "unravelling the labyrinthine roles of different central government agencies and the relevant responsibilities of regional and local government" as a "major exercise".

5.3 The above comments appear somewhat exaggerated and overstated and do not provide a particularly sound rationale or basis for regulatory reform.

5.4 Given the different statutory mandates, roles and responsibilities of the different administrative entities involved it is inevitable there is a degree of initial difficulty in fully understanding the respective roles of different central government and local government agencies

5.5 However, the situation is no different from other regulatory situations where there are multiple agencies involved and these can function perfectly well provided there is a clear understanding among the agencies of the roles and responsibilities of each. Major legislative overhaul is not plainly necessary or the best solution and may, in fact, create unpredictable or adverse consequences.

5.6 It would seem counterproductive to perceive complexity and conceive that simplified or centralised regulatory solutions, such as "oversight," will necessarily provide a more efficient or effective approach.

5.7 The key environmental issues – well integrity and water contamination – are already subject to reasonably comprehensive regulation under the HSE (and associated Petroleum Regulations) and the RMA. This involves detailed consideration of well integrity, environmental assessment, operational conditions, monitoring and enforcement of compliance by regional councils.

5.8 There is no evidence that regulation of oil and gas operations, including fracking, has been deficient in assessing environmental risk, avoiding adverse effects or effective monitoring and compliance.

Improvements to well integrity regulation

5.9 From the TRC's experience over many years, the key area where it is clear that removing legislative duplication would add considerable effectiveness and efficiency is well integrity regulation.

5.10 MBIE is clearly responsible for well integrity. There may well be scope for better interagency cooperation and scope for an integration of certain regulatory processes at central and local levels. This is far from an insurmountable or insuperable task. The key agencies already have a degree of familiarity and cooperative approaches which can clearly be built on in developing different modes of collaboration. In particular, TRC suggests that it be made explicit that regional councils are able to rely on the petroleum regulations with respect to well integrity. It should also be made explicit that well integrity issues are not to become part of RMA processes. Such a change could occur by amending the regulations to make it clear that these apply to RMA processes. Such an opportunity may arise when the Regulations are reviewed to align them with the new workplace safety law.

5.11 In TRC's view, this change needs to occur to provide certainty for all parties, to increase efficiency and avoid duplication particularly in terms of the high cost of accessing specialist technical expertise. The PCE's report already recognises that combining the two regulatory roles is a common theme in reviews in other countries and is reflected in the UK Royal Society report.

5.12 TRC also suggests that further clarification may be obtained by use of MOU's between the relevant agencies involved i.e. MBIE and regional councils. While not sufficient in themselves to address the issue, combined with the legislative change noted above, the MOU's could assist in setting out from an operational perspective who does what and reporting and communication lines between the agencies.

Second PCE Finding – Regulation not fit for purpose

5.13 The second conclusion of the PCE is that "regulation may not be fit for purpose – companies are perhaps being trusted rather too much to do the right thing".

5.14 It is not clear from the PCE interim report where the evidence supporting such a broad assertion is to be found. It is certainly not provided in the interim report.

5.15 As noted in section 2, the Taranaki approach is to undertake extensive regulation and monitoring of the industry and the TRC does not just leave it to companies to regulate or monitor their own performance. Given the rapid technological changes and innovations made by the industry itself it is also important to recognise that industry does have an important and legitimate role in ensuring compliance and best practice, particularly where regulation is goal focussed rather than prescriptive.

5.16 In fact, the regulatory regime outlined above, while clearly capable of improvement in some respects, appears to be reasonably fit for purpose and not permeated by high levels of dependency on unusual levels of corporate cooperation or altruism. Nor is there evidence that the regional or district council regulatory responsibility or compliance requirements have been "devolved" to companies.

5.17 The Council notes that the High Hazards Unit of MBIE is currently developing guidelines to translate the goal-oriented outcomes expressed in the Petroleum Regulations, to detailed operational practices that will enable the industry to comply with the requirements of the Regulations. These guidelines will cover the full life cycle of the well from design, construction, commissioning and operation through to abandonment. It is important that these guidelines explicitly address environmental considerations to ensure integration across health, safety and environmental concerns which will lead to much more effective and efficient regulation of these aspects of the industry.

Third PCE Finding – Social licence not yet earned

5.18 The third interim finding is that the "social licence" for fracking has yet to be "earned". The terminology of a "social licence" appears to be derived from a 2012 International Energy Agency publication ("Golden Rules for a Golden Age of Gas") and appears to have been readily adopted as a somewhat fashionable expression. Social licence is clearly a very imprecise and flexible term, implying some form of quasi-legal public blessing. There is no clear explanation of what a social licence actually means in practical terms and how it would fit into any regulatory system. It is therefore not a particularly

useful or appropriate term for application or adoption in the New Zealand regulatory context. Rights of public information and participation under the RMA confer far wider rights of public or community involvement in decision making than is readily apparent in environmental laws in Europe, the UK or the US.

5.19 It is clearly sensible for those undertaking industrial operations, or seeking resource consents, to consult in a meaningful way with local communities. The expectations of individuals within such communities may prove very high or, possibly, unrealistic. The imprecise concept of a "social licence" being promoted by a public official such as the PCE is somewhat surprising. The public rights of participation defined in the RMA are a more concise and clear basis for defining relevant rights and interests. Apart from this, reasonable levels of public consultation (even where this is not required as part of the consenting process), is a sensible strategy adopted by most experienced natural resource companies or developers as well as local councils.

5.20 The TRC follows all legal requirements with respect to the notification of resource consent applications. The Council is aware of criticism from some quarters that non-notification (which is a fully recognised, legitimate and necessary consent processing option under the RMA), does not involve consultation. We note however, that in the 2012/2013 year almost 1,000 parties (974) were consulted through the Council's non-notified resource consent processes.

5.21 The regulatory regime applicable to fracking, which was outlined above, has been subject to legislative reforms since the PCE report was prepared. These reforms have created far greater scope for better interagency cooperation at the permitting stage as well as providing for independent expert reviews of well integrity.

5.22 One challenge will be to ensure that regions of New Zealand, outside of Taranaki, to whom oil and gas operations are new will be able to share the experience gained by local authorities in Taranaki in a way that assists regulatory decision making, monitoring and enforcement as well as effective community or public involvement in decision-making where warranted. Ensuring such cooperation does not require specific legal change but is much more a process of sharing relevant information and experience. This process is well underway. The TRC has also prepared a Guide to regulating oil and gas exploration and development activities under the RMA with the purpose of sharing

information and experience with other regulators and councils around the country.

6. WELL INTEGRITY – AVOIDANCE OF REGULATORY DUPLICATION

Introduction

6.1 In relation to oil and gas drilling operations, including fracking, well integrity is the critical operational component from a health/safety as well as an environmental perspective. There is currently a significant overlap between regulatory regimes.

6.2 In terms of regulatory reform the essential aim should be to ensure an effective and efficient regulatory regime that avoids unnecessary duplication and cost, while ensuring appropriate environmental controls are able to be put in place where necessary.

6.3 To avoid adverse environmental effects from normal well operations and where well pressures are increased with hydraulic fracturing and deepwell injection of waste activities, well integrity is the most important issue.

6.4 Well integrity can be defined as containment and prevention of the escape of fluids (i.e. liquids or gases) to subterranean formations or surface. Further it can be defined as the structural soundness and strength of a borehole drilled for the purpose of exploring for, appraising, or extracting petroleum. It also includes any borehole for injection or reinjection purposes, down-hole pressure containing equipment, and any pressure containing equipment on top of the well.

6.5 The purpose of the Health and Safety in Employment Act 1992, and regulations made under the Act, are set out below to establish the high level framework under which well integrity is considered. An assessment of the provisions of the HSE (Petroleum Exploration and Extraction) Regulations 2013, from an environmental perspective is then undertaken. The regulations have recently been reviewed and the Council and others participated in the review process. The regulations came into force on 30 June 2013.

Health and Safety in Employment Act 1992 and Regulations

6.6 *The* object of the Health and Safety in Employment Act 1992 ("HSE Act") is to promote the prevention of harm to all persons at work and other persons in, or in the vicinity of, a place of work through a number of methods. These include promoting excellence in health and safety management; defining hazards and harm in a comprehensive way so

that all hazards and harm are covered; imposing various duties on persons who are responsible for work and those who do the work; and setting requirements that relate to taking all practicable steps to ensure health and safety and are flexible to cover different circumstances.

6.7 *Regulations* can be made under section 21 of the HSE Act that impose duties on employees or other people on all or any of the following:

(a) imposing duties relating to the health or safety of employees or other people on all or any of the following:

(i) employers, and other persons who or that control places of work:

(ii) employees:

(iii) designers, manufacturers, sellers, and suppliers, of plant, substances, protective clothing, or protective equipment:

(iv) principals, or self-employed persons:

(b) providing for any other matters contemplated by, or necessary for giving full effect to, the Act.

Assessment of the Petroleum Regulations in environmental management

6.8 The Regulations address well integrity through general duties (s10), the safety case regime (ss21-43), and well operations (ss63-67), including the well examination scheme (ss71-72). Each of these is addressed below and their role in environmental management assessed.

General duties

6.9 The duty holder must take all practicable steps to ensure that an installation, and activities on it, is safe for any person on or near it. The installation must at all times possess such integrity as is reasonably practicable. Integrity in relation to an installation, and wells connected to it, is defined as structural soundness and strength, and stability.

6.10 Hence well integrity should stop any unplanned escape of fluids from the well or from strata to which the well is connected. This matter is considered in more detail in the well control measures section below.

Safety case

6.11 The safety case applies to an installation and includes the wells by which petroleum is extracted. It includes a detailed safety management system that provides for all activities that will, or are likely to, take place on, or in connection with, the installation. Performance monitoring of the system includes an overview of the arrangements in place for independent and competent persons to verify that safety-critical elements remain effective (schedule 1, (m) (iv)) and arrangements are in place for the periodic assessment of the installation's (which includes wells) integrity (schedule 1 (m) (v)).

Some other key parts of the Act relating to safety cases are as follows:

- Particulars of all NZ and international standards that have been applied or will be applied must be set out (schedule 4, s6).
- The installation cannot be operated without an accepted safety case (s25).
- The case must meet certain requirements (s26).
- Consultation with petroleum workers, who may be affected by a safety incident, must be undertaken (s27).
- Further information requests may be made (s29).
- Criteria for acceptance of a case have been established (s31).
- There is an ability to impose limits or conditions on the case (s32). The case may be rejected (s33).
- The case must be revised in certain situations (s34). The Secretary may request a revised case (s35).
- The case must be reviewed within 5 years (s36). The case may be withdrawn under certain circumstances (s38).
- And records of the safety case must be retained (s41).

6.12 The provision of a safety case means well integrity risks have been identified, monitored, and managed so that there should not be any unplanned escape of fluids from the well. An 'as far as reasonably practicable' test is applied to this requirement.

6.13 The safety case process has many elements of a resource consent process under the RMA, except there is no public submissions process. The regulator has an active role in processing the safety case application, and an ongoing role through investigating any safety incidents or other matters that could affect the safety case and safety of the installation. The ultimate power is to be able to withdraw the safety case approval whereby the installation can no longer operate.

Well operation obligations

6.14 The well operator's primary duty is to ensure that the well is designed, constructed, commissioned, equipped, operated, maintained, modified, suspended, and abandoned so that, **as far as reasonably practicable, there can be no unplanned escape of fluids from the well**; and, that any issues to the health and safety of persons from the well or anything in it, or from strata to which the well is connected, are as low as is reasonably practicable (s64).

6.15 A well operator must assess conditions below ground **before** a well is designed (s66) in order to comply with the primary duty set out above. Well operations are required to continue to assess conditions below ground during well operations (s67). Well operations mean drilling, completion, suspension, or abandonment of a well (s3).

6.16 A well operator must take all reasonable steps to ensure that every part of a well is composed of suitable material (s69) in order to comply with the primary duty set out above.

6.17 A well operator is required to prepare and implement a well examination scheme before the design of a well is commenced or adopted (s71). The scheme means arrangements for examinations of wells that are recorded in writing and suitable for ensuring (together with the assistance of any other measures the well operator may take) that **the well is designed, constructed, operated, maintained, modified, suspended, and abandoned so that, so far as reasonably practicable, there can be no unplanned escape of fluids from the well**; risks to health and safety of persons from the well or anything in it, or from strata to which the well is connected, are as low as reasonably practicable; and conducted by an independent and competent person. 'Independent' and 'competent' are defined in section 3 of the regulations. Transition provisions apply in sections 71(5)–(6).

6.18 A well operator must retain records of the well examination scheme including revision of the scheme, examination and testing carried out, the findings of any examination and testing carried out, and remedial action recommended and performed (s72).

6.19 A well operator must give notice of well operations (s73), 21 days before commencement, and schedule 7 of the Regulations sets out the comprehensive information that is required to be provided, which includes well integrity information.

6.20 A well operator must make and retain daily well operation reports and store these at an address notified by the Secretary and must make them available to an inspector on request (s76). The well operations addressed include drilling, completion, workover, suspension or abandonment, and any other operation involving substantial risk of unplanned escape of fluids from the well.

6.21 A well operator must notify any dangerous occurrence as soon as practicable. A dangerous occurrence is defined in the regulations and includes:

- an event that did not cause, but might reasonably have caused, a major accident;
- the failure of any part of a well whose failure would cause or contribute to, or whose purpose is **to prevent or limit the effect of, the unintentional release of fluids from a well** or a reservoir being drawn on by a well;
- damage to, or failure of, a safety critical element that required intervention to ensure it will operate as designed;
- an unintended collapse of and installation or part of an installation (noting a well is included in the definition of an installation); and
- damage to an installation caused by earthquakes or other natural events that had the potential to cause death or serious harm of any person.

6.22 A permit holder must prepare an emergency response plan for the installation (s79) and regularly review and test it (s80). The plan is for responding to emergencies that occur while petroleum workers are working on an installation (noting a well is included in the definition of an installation).

Capacity and capability

6.23 The capability to regulate well integrity matters naturally resides in MBIE and the High Hazards Unit pursuant to the permitting process under the CMA and the regulation of HSE under the Petroleum Regulations. Geologists, drillers, well engineers, safety specialists, and others possessing relevant skill sets are or need to be available to regulate well integrity from both an environmental and HSE perspective so as to avoid significant duplication and additional costs. Specialist consulting assistance can be accessed outside MBIE and this is certainly done for well integrity.

6.24 Councils also generally have capability and capacity to regulate the environmental aspects of oil and gas activities (including fracking operations) and share expertise. However, one area that presents potential difficulties and challenges for councils in terms of capability is addressing well integrity issues. This is a highly technical, specialised, and costly area to adequately resource, and there are very limited expertise and resources available within New Zealand. Every Council in New Zealand should not be required or expected to develop this capability when this capability and capacity is already established within MBIE.

Detail and avoidance of potential gaps

6.25 It will be important when various parties are working through ensuring linkages between the RMA and Petroleum Regulations that all parties understand the scope and coverage of the exercise and where the different jurisdictions begin and end. This will need to identify any potential gaps in the regulatory framework that sit at the edges of well integrity and ensure these are closed off.

6.26 These are matters of detail but are nevertheless important to ensure a comprehensive and fully integrated regulatory regime is put in place.

Regulatory solutions

6.27 The regulatory framework, capability and capacity to address the gaps that have been identified in relation to well operations (including the critically important well integrity issues), are already in place with the new HSE (Petroleum Exploration and Extraction) Regulations 2013 administered by the High Hazard Unit in MBIE.

6.28 It would appear that a well operator's primary duty under clause 64 of the Petroleum Exploration and Extraction Regulations covers all aspects of well operations from design and construction through to commissioning, operation, maintenance and abandonment (i.e. the very broad wording of clause 64 and the definition of 'well').

6.29 Drilling a well and installing casing are two intertwined activities. A section of hole is drilled and then casing set and cemented. The process is then repeated.

6.30 From an RMA perspective, the drilling of a well into land and associated construction and commissioning of the well (steel casing and cement), are essentially section 9 land use matters, and are more than adequately addressed in the Regulations.

6.31 Any planned discharge from the well, such as deepwell injection, hydraulic fracturing, or water flooding operations, and associated discharge to land is addressed under section 15 RMA.

6.32 There are however, some other legal issues to consider. The well operator's duty under clause 64 of the Regulations is to ensure that a well is designed, constructed, operated etc. so that 'as far as is reasonably practicable, there can be no unplanned escape of fluids from the well.' This contrasts to the general RMA duty to ensure that 'no person may discharge any contaminant… unless…'. In reality the action on the ground to ensure best practice will be the same and it is important that this reality be recognised.

6.33 These existing provisions need to be fine tuned to work more closely together to reduce duplication and cost. As noted earlier in this submission, there is an opportunity to review the Petroleum Regulations with the new workplace safety law changes.

6.34 The close scrutiny of well operations under the Petroleum Regulations, coupled with the detailed guidelines being prepared by the High Hazards Unit over the next six months, provide a very good basis for ensuring that the risk of leakages to the environment are in fact very low. This is reinforced by the 'good industry practise' elements of the permitting regime under the CMA. Councils should therefore be able to rely on these provisions in developing RMA rules or regulations controlling discharges.

6.35 Possible solutions could be an amendment to link the Regulations into RMA processes and/or MOUs between Councils and MBIE regulators under the Petroleum Regulations and Crown Minerals Act.

6.36 An example where one piece of legislation is linked to another (with the aim of avoiding duplication) is section 142 of HSNO. This section of HSNO provides that RMA instruments can only include more stringent requirements than HSNO when they are considered necessary for the purposes of the RMA. Where HSNO requirements are sufficient to meet the purposes of the RMA there is no requirement for specific RMA measures.

6.37 Guidance notes for managing hazardous substances on the Quality Planning website state that plan provisions should not duplicate requirements imposed by the HASNO Act (or other statutes) and that the RMA need only deal with particular risks associated with a particular site that are not already managed by the generic controls under HSNO.

6.38 A similar approach could be applied to the regulation of discharges from well operations under the RMA i.e. that RMA instruments can only include more stringent requirements in relation to well operations for the purposes of the RMA. A council carrying out its section 32 duties under the RMA may consider that all environmental risks/effects are adequately addressed under the Petroleum Regulations and it is not efficient or effective to duplicate this work. On the other hand, councils may choose to place additional requirements on well operations for RMA reasons e.g. that only water based muds are used when drilling through the freshwater zone.

6.39 To remove current legal uncertainty it is important that it be made explicit that the Petroleum Regulations can be relied on by Councils for the management of environmental effects, unless Councils wish to have more stringent regulation for RMA purposes.

6.40 An MOU type approach could also be used to extend the positive existing working relationship between MBIE and Councils. Such an MOU might include:

(a) Sharing environmental and health and safety incident information to enable either party to determine an appropriate response under their regulatory duties (e.g. any subsurface casing integrity issue that did not pose a risk to health and safety, but could relevant for an environmental assessment).

(b) Having access to routine records that demonstrate that well integrity is being maintained and managed.

(c) Access to data from daily well operation reports (s76 Regulations) for informing Council responsibilities for section 15 RMA matters. For example any drilling losses to the formation and the type of mud system being used.

(d) Reporting dangerous occurrences.

(e) Any other matter arising from discussions between the parties.

6.41 MOUs could also usefully be put in place until such time as a law change is made.

7. RECOMMENDATIONS FOR LEGISLATIVE CHANGE

7.1 Fracking operations as part of oil and gas drilling operations are not so technically unusual or environmentally risky as to warrant major revisions to existing regulatory frameworks or regulatory responses, or the creation of new statutory institutions or central oversight agencies.

7.2 Practical experience in Taranaki indicates that existing regulatory frameworks with several important clarifications and amendments will be more than capable of ensuring that best practices are applied to all oil and gas drilling operations, including fracking operations.

7.3 The somewhat sweeping criticisms of the existing regulatory regime contained in the PCE's interim report do not appear warranted or supported by any practical evidence. In particular, these criticisms do not appear to take into account the context or experience in Taranaki or recent amendments to the CMA and Petroleum Regulations.

7.4 There are clearly some amendments to the existing regulatory frameworks and requirements which would be helpful in ensuring the regulation of oil and gas drilling (including fracking) ensures that best practices are adopted by industry, and are subject to continuous review and, where necessary, improvements.

7.5 The first and most important change would be for the existing HSE and associated Petroleum Regulations to be amended to make it explicit that regulation of well integrity is within the sole and exclusive jurisdiction of MBIE (High Hazards Unit). This amendment should also make it explicit that in exercising powers and functions under the RMA

Councils are legally entitled to rely on the well integrity decision-making of MBIE and are not obliged or required to undertake their own separate evaluations or assessments of well integrity issues. However as previously noted in this submission (see section "Detail and potential gaps") there will almost certainly be a case for a residual district and regional council role under the RMA to apply to well integrity issues. Those matters that relate to core RMA functions that sit at the fringes of well integrity need to be addressed to ensure that when the linkages between Petroleum Regulations and the RMA are tightened up, any gaps that may potentially exist are closed off. This will provide an important backstop for councils to act if and when necessary.

7.6 To provide absolute certainty and clarity an appropriate amendment to the RMA is needed to the effect that Councils are explicitly entitled to rely on MBIE decision-making with respect to well integrity. Similarly, it should be made explicit in the RMA that decisions in relation to well integrity under the HSE and associated Petroleum Regulations are not able to be questioned or re-litigated in RMA decision making processes (whether in relation to regulatory requirements or actions as well as resource consent and planning or rule-making processes).

7.7 It should also be made clear that such provisions apply to RMA decision-making of Councils to the outer edge of the territorial sea as well as to marine consent decision-making by the EPA in the EEZ.

7.8 The overall objective of the above amendments is to enable both Councils and the EPA to avoid unnecessary duplication of responsibility for well integrity, as well as avoid the need to promulgate special regulatory plans or rules related to well integrity within onshore and offshore (EEZ) jurisdictions.

7.9 In a more general sense it will assist Ministerial decision-making under the CMA and HSE (and associated Petroleum Regulations) to have a more explicit capability (or discretion) to consider significant environmental risks or issues at the pre-permitting stage. This should not be expressed as a decision-making obligation or duty but as an entirely discretionary consideration. In practical terms this would mean having the capacity to seek advice from Councils (onshore) or the EPA (offshore EEZ) prior to setting conditions on permits. Such a provision goes further than the current CMA and HSE and associated Petroleum Regulations.

7.10 The intention would not be to in any way duplicate the RMA or EEZ decision-making roles of Councils or the EPA. The emphasis and purpose would be to provide an opportunity for relevant agencies to provide the Minister (and delegated decision-makers) with early warning only of significant environmental considerations or issues prior to final decisions and for appropriate conditions to be imposed where significant environmental issues have been identified (e.g. proximity to environmentally sensitive areas or other potentially significant risks, e.g. proximity to aquifers or water supplies).

7.11 Control of any discharges of contaminants to water or land should remain explicitly within the regulatory jurisdiction of Regional Councils (or the EPA in the EEZ).

7.12 It should be made explicit that while RMA processes and requirements potentially apply it must remain within the discretion of Councils under the RMA to evaluate actual environmental effects and risks in determining whether or not to incorporate rules in Regional Plans; require resource consents (notified or non-notified); or take other forms of regulatory action.

7.13 In combination with the above legislative clarification and amendments the need for MOUs clarifying roles and establishing information sharing and cooperation roles between relevant agencies such as MBIE, HSNO (EPA) and Councils should be investigated and suitable arrangements made a priority.

7.14 Similarly specific mechanisms to share experience and expertise between Regional and District Councils and MBIE/HSNO/EPA should be made a priority.

7.15 The above changes represent fine tuning of the regulatory framework rather than wholesale reform. They require a combination of legislative amendments to the existing regulatory regimes as well as improving administrative and cooperative arrangements between relevant central and local government agencies. In combination this appears the most practical and effective way to ensure that "best practice" in relation to oil and gas operations (including fracking) is achieved without unnecessary duplication or additional layers of unwarranted regulatory decision-making or oversight.

7.16 This fine tuning of our regulatory systems will take New Zealand to the forefront of regulation of the oil and gas industry.

Appendix 1

Examples of annual TRC compliance monitoring reports

Todd Taranaki Limited. Mangahewa Exploration Wellsite Monitoring Programme Report. September 2011 – December 2012. Technical Report 2012 – 85. (1.4 MB)

Greymouth Petroleum Limited. Turangi B Exploration Wellsite Monitoring Programme Report. Technical Report 2011 – 104. (3.6 MB)

Shell Todd Oil Services Ltd. Maui and Kapuni Production Stations Monitoring Programmes Annual Report 2011 – 2012. Technical Report 2012 – 35. (5.2 MB)

Appendix 2

Recent state of the environment monitoring reports

Fresh Water Macroinvertebrate Fauna Biological Monitoring Programme Annual State of the Environment Monitoring Report 2011 – 2012. Technical Report 2012 – 18 (and Report CF535). (5 MB)

Freshwater Physicochemical Programme State of the Environment Monitoring Annual Report 2011 – 2012. Technical Report 2012 – 27. (1.6 MB)

Appendix 3

Examples of TRC monitoring programme reports for hydraulic fracturing (with associated resource consents and conditions included)

Greymouth Petroleum Limited. Turangi –B Hydraulic Fracturing Groundwater Monitoring Programme Report 2011 – 2013. Technical Report 2013 – 14. (1.5 MB)

Todd Taranaki Limited. Mangahewa – C Hydraulic Fracturing Groundwater Monitoring Programme Report 2011 – 2013. Technical Report 2013 – 15. (1.7 MB)

Appendix 4

TRC, 2013. Guide to regulating oil and gas exploration and development activities under the Resource Management Act.
(3.5 MB)

Appendix 5

TRC, 2012. Hydrogeologic risk assessment of hydraulic fracturing for gas recovery in the Taranaki region. (920 KB)

Appendices to the Hydrogeologic risk assessment. (9.8 MB)

Appendix 6

Sherburn, S. 2012. An assessment of the effects of hydraulic fracturing on seismicity in the Taranaki region. Consultancy report 2012/50. GNS Science. Wairakei. (1.4 MB)

Appendix 7

TRC, 2012. Investigation of air quality arising from flaring of fracturing fluids emissions and ambient air quality. Technical Report 2012 – 03. (1.2 MB)

Appendices to Investigation of air quality. (4.6 MB)

Appendix 8

Air Quality Management Ltd. 2013. Atmospheric dispersion modelling of discharges to air from the flaring of fracturing fluid. (907 KB)

Appendix 9

TRC, 2013. Radioactivity in hydrocarbon exploration (including fracturing activities). (354 KB)

Appendix 10

TRC, 2013. Origin Energy Resources New Zealand Limited. Deep Well Injection Monitoring Programme Triennial Report 2009 – 2012. Technical Report 2011 – 85. (838 KB)

TRC, 2013. Shell Todd Oil Services Limited. Deep Well Injection Monitoring Programme Triennial Report 2009 – 2012. Technical Report 2012 – 66. (648 KB)

Appendix 11

Zemansky, G. Review of regulation of deep well injection under the Resource Management Act. GNS Science Consultancy Report 2012/200. February 2013. (1.5 MB)

Appendix 12

TRC, 2012. Origin Energy Resources NZ Limited. Drilling Waste Landfarms Monitoring Programmes Annual Report 2010 – 2011. Technical report 2011 – 49. (3.3 MB)

TRC, 2013. BTW Company Limited Brown Road Landfarm Monitoring Programme Annual Report 2010 – 2011. Technical Report 2011 – 60. (10 MB)

Appendix 13

Pattle Delamore Partners Ltd, 2013. Review of petroleum waste land farming. (Together with Taranaki Regional Council and Pattle Delamore Partners notes on implementation of the Review's recommendations). (380 KB)

agKnowledge Ltd, 2013. The Taranaki landfarms are they 'Fit for Purpose'. Report prepared by Dr D C Edmeades. (237 KB)