

**Initial Review of the  
REGULATIONS FOR PETROLEUM EXPLORATION AND PRODUCTION**

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## Treasure Karoo Action Group

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## Summary

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Following the release of the draft regulations on petroleum exploration and exploitation in October 2013 and after almost two years have passed, final regulations have been published in June 2015.

While some improvements have been noted, overall the regulations are inadequate and flawed. It is trite that the political momentum established by President Zuma's statements on shale gas is largely responsible for the rush to pursue shale gas mining in South Africa. The same can be said of the lack of science and due process in the approach adopted by the Department of Minerals.

A dearth of public consultation and a broad and inclusive investigation (such as that expected to be delivered by the Strategic Environmental Assessment), present two of the most significant issues in relation to these regulations.

Most of our comments on the draft regulations are still valid and applicable to the final regulations.

Below are a few key areas in the regulations that in our view cause the regulations to be fatally flawed:

### **Lack of scientific basis specific to South African conditions**

Strong and appropriate regulations are based on appropriate science. Research to inform regulations on shale gas of the potential impacts on the South African receiving environment is virtually non-existent. We believe that the strategic environmental assessment (SEA) would go a long way to address this information gap. No licenses for exploration should be issued until the regulatory framework has been sufficiently and appropriately augmented.

### **The Strategic Environmental Assessment**

The regulations have been published mere weeks after the announcement that the SEA on shale gas mining will be conducted. This SEA is expected to take up to two years and provide the leadership and citizens of South Africa with a definitive, science-based and unimpeachable

conclusion on shale gas mining. To issue regulations ahead of the results of the SEA serves to undermine that process and place the credibility of the regulations in jeopardy.

Accordingly, the prudent route would be to suspend the regulations (and therefore also any authority for exploration) until the SEA and its concomitant studies are concluded. At that time, the appropriate authority will be in a position to make meaningful amendments to the regulations.

### **Public consultation**

The public commenting period initially allowed on the draft regulations was a mere 30 days. Despite requests to extend this inadequate period, no extension was granted. We experienced this time period to be wholly inadequate, more specifically due to the technicality of the regulations and the requirement to brief specialists for expert opinion on some aspects. Thus, the time period was insufficient for an organisation like ours and it follows most reasonably that this would have been even more so for members of the public.

The regulations make insufficient provision for public consultation relating to several processes, including the 'risk assessments' and 'water monitoring programmes'.

### **The powers of the Minister under the MPRDA**

Due to the recent deletion of section 107(1)(a) of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) which provided for the Minister to publish regulations under this act, the Minister currently does not have this power and the current regulations may not have been published in accordance with the MPRDA.<sup>1</sup>

### **Significant problems with the content of the regulations**

There are multiple shortcomings in the regulations. The generic and vague nature of the wording establishes serious loopholes and further erodes the quality of the regulations. Sections dealing

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<sup>1</sup> <http://cer.org.za/news/as-new-environmental-laws-for-mines-start-coming-into-effect-confusion-reigns>

with important aspects such as groundwater monitoring are non-specific and open to interpretation. In general, this leads to a lack of standardisation in operating standards between different operators. The regulations also rely heavily on American standards.

The composition of the regulations allows applicants and operators freedom in the methods, techniques and technologies adopted for environmental management. This is a clear signal of a lack of capacity and ability of government to sufficiently comprehend and address the risks associated with shale gas exploration and production, and impacts on governments ability to prescribe appropriate standards and regulations.

### **API standards**

The regulations rely extensively on the American Petroleum Institute (API) , an industry-funded trade association, and its own voluntary industry standards. These standards have been developed by industry based on the American conditions. Regulations need to be specifically drafted bearing in mind the unique South African attributes and conditions so as to guarantee environmental and community safety. Aspects such as water availability, geology, mineral rights and ecological aspects, to name a few, are crucial to consider in ensuring accurate and appropriate regulations.

## Introduction

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Almost two years after the draft regulations on shale gas mining were released (on 15 October 2013), the final regulations have now been published. This marks more than a year and a half of frequent communication and submissions by us to government on this matter. Only 30 days were allowed for public commenting on the regulations and despite requests to extend this timeframe, it fell on deaf ears.

The apparent political momentum behind shale gas mining in South Africa has been strengthened by President Zuma's utterings during the SONA's. It would appear as if this momentum has been responsible for the hasty publishing of regulations when it is clear that they have required a lot more time and work.

We strongly believe that these regulations should not have been published, for several reasons, and that final regulations should only be issued at such a stage when the SEA and supporting studies have been concluded and the legislative regime can appropriately be augmented and amended, in the case that the SEA concludes that shale gas exploration and/or mining should proceed.

Exploration rights should also not be granted until such a time that all the necessary regulations, safeguards, government capacity and other factors are in place.

### **Lack of scientific basis specific to South African conditions**

We believe that credible regulations and legislation are based on appropriate and credible science and research. Fundamentally, the efficacy of the published regulations is questionable at best due to the fact that they have been published in a void of an appropriate, complete and reliable scientific investigation of the likely implications of shale gas exploration and production in South Africa. In essence, due to the fact that appropriate science on the receiving South African

environment has not been incorporated in the drafting process, there are no guarantees that the regulations will be able to provide for operations in a way that would not risk the safety and integrity of human health and well-being and the protection of the environment. To date, to the best of our knowledge, no input from a medical professional has been incorporated in the regulations to provide for safeguards that would protect public health.

### **The Strategic Environmental Assessment**

The recently announced Strategic Environmental Assessment (SEA) is expected to take a minimum of two years to complete and would investigate social, economic and environmental implications of shale gas mining in South Africa. The Minister of Environmental Affairs stated that the SEA would be able to influence the legislative environment pertaining to shale gas<sup>2</sup>. While significant loopholes, shortcomings and problem areas exist in the current regulatory framework, it would be logical to suspend the regulations until the SEA has been completed and the regulatory framework has been augmented accordingly.

### **Public consultation**

Since 2011, the government has made public commitments to conduct a comprehensive public consultation process around the issue of shale gas. To date this has not materialised and many communities living within the affected regions are unaware of the potential impacts of shale gas mining. In 2014, it was stated explicitly at parliament on several occasions by senior executive DMR personnel that public consultation would take place prior to the publishing of regulations.<sup>3</sup>

The initial 30 days public commenting period allowed for the draft regulations was inadequate for an organisation like ours, having specialised in the issues surrounding shale gas mining – let alone the general public. We had to request specialist input on some matters from scientists abroad and

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<sup>2</sup> <http://www.bdlive.co.za/national/science/2015/05/12/environmental-assessment-may-affect-rules-of-fracking>

<sup>3</sup> <http://www.iol.co.za/business/news/fracking-pollutes-drinking-water-1.1744080#.VXiFhUZnS00> ; <http://www.iol.co.za/scitech/science/environment/fracking-could-start-by-mid-2016-1.1772066>

struggled to finalise our comments on time. Many aspects are technical and require time and research in order to prepare meaningful comments.

Despite these facts being pointed out by us to the Department of Mineral Resources, the Portfolio Committee on Mineral Resources as well as the Presidency and other government sectors, on several occasions during the past few months, the regulations were published in the Government Gazette on June 3 2015.

The regulations should provide for far greater opportunities for public consultation during various stages of authorisation, including the submission of risk assessments, well construction and water monitoring programmes.

### **The powers of the Minister under the MPRDA**

As pointed out by the Centre for Environmental Rights in 2014<sup>4</sup>, due to the deletion of section 107(1)(a) of the MPRDA, the Minister of Mineral Resources does not have the power to publish regulations under the MPRDA. This further undermines the legality and sense (or lack thereof) of the process followed to date.

### **Significant problems with the content of the regulations**

Notwithstanding these important issues, there are significant flaws in the current regulations. Some of these problem areas, although not exhaustively, have been identified more specifically below. There also remains significant uncertainty around many areas, including waste management, water withdrawal, the protection of groundwater sources, the compatibility of shale gas mining with tourism and agriculture and several other issues. Current waste disposal sites are also not expected to be able to deal with the nature and volumes of waste generated by shale gas exploration and mining. Air pollution and ancillary construction of roads, pipelines and other infrastructure are also not adequately considered at all.

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<sup>4</sup> <http://cer.org.za/news/as-new-environmental-laws-for-mines-start-coming-into-effect-confusion-reigns>

Ambiguous terminology has been applied that in many instances have not been included in the definitions. No regulation for the placement, routing, construction, maintenance, monitoring and ultimate decommissioning of gas pipelines and associated infrastructure is included. It is also not stated (as in the draft regulations) whether these regulations apply to underground coal gasification and coal seam gas.

Overall, the regulations are very vague and non-specific even in areas where it would normally be expected to provide clear and specific thresholds and guidelines. The applicants are to a large extent essentially given free rein to prepare and submit plans for drilling, venting and flaring, dust management, hydraulic fracturing, water monitoring, reporting and environmental management of several aspects and phases of the operations.

Plans are requested to be submitted to the competent or otherwise appropriate authority for approval.

Ideally, processes, mechanisms, and specifications should be prescribed for companies to comply with, rather than companies submitting plans (not based on clear prescribed guidelines) to authorities. This again illustrates the inability and lack of capacity of South African authorities to sufficiently understand the technology and intrinsic aspects of shale gas mining and exploration to be in a position to prescribe such guidelines. The completion of the SEA would go a long way in addressing these issues.

If the regulations are allowed to stand as they are, this would undoubtedly lead to different operating standards by permit holders and a general lack of standardisation. It is also highly questionable whether authorities would be equipped to accurately determine whether applications and methods described in the plans for environmental management would be effective and appropriate.

#### **API standards**

The current regulations rely extensively on the American petroleum Institute (API) standards. The API is an industry trade association (industry-funded) and standards are based on voluntary industry standards for operation. The standards are also based on American conditions (especially geological standards) and due to the significant differences between the South African and American receiving environments, there are no guarantees that these standards will ensure the protection of water resources, the environment and human health and safety.

## Specific observations on the regulations

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(Refer to section numbers of the regulation in question. For the sake of brevity, the section detailed in the Regulations is not repeated here).

### Definitions

- “applicant” – the definition should rather describe the company or person applying for a right, than a company or person intending to apply for a right.
- “exploration well” – the statement “any type of pressure tests” is very vague and should be specified. No indication of the orientation of the well is provided, does this imply that exploration wells may be drilled vertically and horizontally.
- “geohazard” – the description reads that it only refers to “widespread damage or risk.” This is not appropriate. Risk and damage should not only be defined as important when widespread, but also when it is likely to be significant. Significant impacts are not always necessarily widespread.
- “groundwater” - No reference is made to water such as brine that may exist at depth beyond the saturated zone.
- “hydraulic fracturing” – The definition should be revised. In the case where hydraulic fracturing is performed unsuccessfully and petroleum does not flow, the

attempt at inducing the flow of gas or oil should still be considered as hydraulic fracturing.

- “naturally occurring radioactive material” – The phrase “natural materials” may need to be expanded upon.
- The definition for “saturated zone” would need to be tidied up.
- “Stratigraphic well” –Once again the orientation of the well is not provided. Does this refer to horizontal or vertical wells or both? The distinction between an exploration well” and a “stratigraphic well” is not clear. The purpose of defining the terms is to avoid ambiguity, not to add further confusion. Both well types are drilled for the purposes of determining geological and geophysical data and to determine the presence of petroleum products, with the difference that a stratigraphic well will not be used for production purposes. Does this therefore imply that an exploration well can be used for production and will therefore become a “production well” It is very important that these stratigraphic wells also be subjected to environmental authorisation.
- “well integrity” – should have a different meaning than as described in regulations. Well integrity refers to the ability of the well and relating structures to withstand pressure and other factors to ensure the long-term safety of the environment, ground and surface water, air quality and health and safety, among other aspects. Reference is made to the life cycle of a well, without defining what a well cycle is. It is more apparent when a well begins, but the end of a well is not clear. Clear and unambiguous time frames are required. A well and all the associated well linings will remain after production has ceased, but will continue to deteriorate with time. It is therefore clear that the well integrity will not last *ad infinitum*.

## **Environmental Impact Assessment**

**S 86(1):**

- This should include stratigraphic wells.

**S 86(2)(a):**

- The scale of the geological maps must be specified. Drawing a large scale geological map will not include small features such as joint orientation and at frequency, which may be included at a smaller scale. It is therefore imperative that the scale of mapping is specified to that an indication of the amount of detail required by the holder is provided

**S86(2)(e):**

- It is indicated that physical and chemical properties of the stratigraphic formations must be provided. Once again this is nebulous as the scale of the formation is not provided. Typical stratigraphic units are described at scales of super groups, groups, sub-groups, formation, members and beds. Which of these units are to be tested?

**S86(2)(f):**

- Geological cross sections are to be provided. In order to make these meaningful the regulations must specify the minimum number of boreholes required and the minimum distance from the proposed well location. Few holes spread far apart render a geological cross section all but useless, particularly in structurally complex areas.

**S 86(4):**

- CSIR – Industrial? Wrong tile provided for the institution

**Assessment of Conditions below ground**

**S 87 (i):**

- No-go areas should be identified

- not clear : applicant or holder (so both) must conduct same research activities, including geological drilling and submit for environmental authorisation. The core drilling/stratigraphic boreholes itself should also be subject to authorisation as it may impact significantly on the environment. This would lead (due to the wording of the definition for “applicant”) to prospective applicants for exploration rights drilling stratigraphic wells without environmental authorisation or prescribed environmental management processes and tools. This is unacceptable.

### **Water Resource Monitoring**

#### **S 88(1):**

- It must be explicitly stated that the water monitoring plan is mandatory for surface and groundwater resources. It is not sufficient to state that groundwater aquifers be identified based only on maps – not all aquifers in the application areas have been thoroughly mapped. Other methods should also be prescribed and may include using local knowledge of farmers and farmers’ associations in the application area.
- It is indicated that a hydrocensus is conducted on at least a 3km radius. Boreholes located within a 1km radius are more likely to be contaminated by groundwater pollution and methane migration and therefore whilst a 3km radius is considered adequate, more effort must be placed on determining baseline water quality on holes located closer to the position of the proposed production well. The regulation must specify the position of holes and the distances from the well site.

#### **S 88(2):**

- The regulations should specify the methodology, frequency etc – to ensure good quality and standardised operating standards. A uniform testing regime must be required, so that

results from all baseline water samples are comparable. The presence of biogenic and thermogenic methane must also be tested.

**S 88(4):**

- This section is alarmingly vague for such an important aspect. What is meant by "accredited"? SANAS accredited?
- The regulations only state that water must be analysed - for which compounds and attributes? This must be undertaken by an independent and appropriately qualified and experienced consultant.

**S 88(5):**

- It should also include the actual test results

**S 88(7):**

- the information relating to water monitoring and results must be publically available and accessible (preferably on an online platform).

**S 88(8)(a):**

- including chemicals or additives

**S 88(9):**

- Often gas migration causes concern – since gas and petroleum are synonymous according to the definitions provided, presence of gas in water – a clear human health and safety threat – would according to the wording of this section then not be published. This is a serious flaw. The isotope of the gas should also be tested to verify whether the gas is thermogenic or biogenic in nature. A full gas isotope content and fingerprinting exercise should be built into the initial groundwater baseline testing programmes.

- The regulations should specify how, when and where these results must be published. It is not clear what the regulations require.

### **Assessment of related seismicity**

#### **S 89(1)(a):**

- stressed faults must be avoided. This does not take into account that all faults are subject to stress at a lesser or greater extent. So how stressed must the faults be that are to be avoided. It also does not take into account the possibility that stresses within the hydraulic fracture zone will be subjected to increasing stress regimes during fracking.

#### **S 89 (1)(c):**

- seismic monitoring must be undertaken during and post fracturing. No indication is provided how long seismic monitoring must continue for, hours, days, months, years?

#### **S 89 (2)(d):**

- stress data from proximal boreholes. A dictionary definition of the word "proximal" is given as "close to" which is very imprecise. A specific distance must be provided to avoid ambiguity.

#### **S 89(6):**

- due to a missing word or grammar error it is not sure what this section aims to convey

#### **S 89(8):**

- how was the period of 3 years arrived at?

### **Site containment**

#### **S 91:**

- Holders must prevent contamination of the environment by providing a suitable impermeable underlay system. Clearly this is inadequate for air borne contaminants. No indication is provided how these pollutants are to be controlled.

### **Well risk identification and assessment**

**S 94(2):**

- it is important that the activities take the long term view on safety and well integrity. Wells typically remain for more several centuries and would need to ensure environmental protection indefinitely.

**S 94(2)(c):**

- Reference is made to a "stimulation well". No definition is provided for a stimulation well, and this term is once again ambiguous.

**S 94(2)(g) and (h):**

- Reference is made to potential deformations of aquifers, geological strata and ground surface, however, no indication is provided as to how the potential deformation is to be monitored. In the event of deformation occurring the regulations provide no directive as to how this is to be rectified and remediated.

**Well design**

**S 95:**

- No indication of the minimum or maximum diameter of well bores are provided. This will impact on the minimum or maximum thickness of the cement grout injected into the annulus. Too thick and the cement is more prone to crack, and too thin it will not provide an adequate barrier and will be susceptible to corrosion and chemical attack within a shorter time frame. The minimum and maximum thickness of the cement within the annulus must be specified.
- This entire section appears to be poorly considered and very poorly specified. It leaves substantial latitude available for the licence holder to apply individual standards to an aspect of shale gas extraction that will have significant long term implications.

**S 95(3)(a):**

- The height of cement in annulus outside casing. Which casing surface, intermediate, production or all? Once again ambiguous.

**S 95(3)(b):**

- Permeable formations that must be covered. All formations are permeable to a lesser or greater extent. The regulator must provide the permeability criteria or the formations.

**S 95(3)(d):**

- The need for plugs to cover the full diameter. A plug by definition cannot be a plug unless it spans the full diameter of the hole and therefore effectively prevents migration of fluids from one elevation to another.

**S 95 (3)(f):**

- The difficulty of injecting cement into the annulus. Is this degree of effort to pump cement into the annulus a part of the decommissioning process as suggest y the heading to section 3. Cement is pumped during the well construction phase and during the subsequent rehabilitation of failed cement integrity. Is it proposed that the annulus of wells are to be cemented upon decommissioning?

**S 95(4):**

- Spacing of wells on a single well pad. The onus is upon the regulator to provide guidance as to the minimum and maximum well that may be drilled from a single pad. Similarly the distance separating individual well must also be specified.

**Well construction**

**S 96-100:**

- the thickness of casing cement is not specified and is a critical omission.

## Surface casing

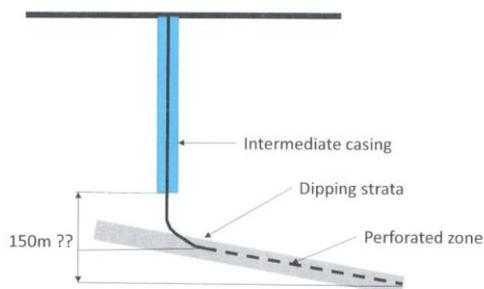
### S98:

- The implication of the regulation regarding the placement of the surface casing 60m below the deepest fresh water **or at least** 100m above the top of the expected petroleum bearing zone, is that fracking could occur at depths as shallow as 100m. Whilst this is unfeasible, it allows the holder to frack from any depth below 100m. A regulation must prescribe the minimum depth at which any fracking activity is permitted.

## Production casing

### S 100:

- Cementing of production casing must be set and cemented 150m **above** perforated zone. In the event of a fully horizontal petroleum bearing horizon, this recommendation makes sense, however, in a dipping horizon, which is more likely, it becomes nonsense (see sketch below). A specification must be provided that is unambiguous and not subject to interpretation.



## Centralisers

### S 101(3):

- It is not clear whether the term "cellar" is correct or should read "collar". The cellar is the area beneath the drill rig platform and ground level, and clearly centralisers will not be

placed within this zone. Alternatively the collar is the position at which the borehole intersects ground level and immediately below ground level, a zone in which centralisers may be used. Once again the use of technical terminology is used without a clear understanding of the process.

- The regulation indicates that pipe (casing?) centralisers must be placed at every fourth joint. Surely this specification must provide an absolute length between placement of centralisers. Pipes (casing?) may be supplied and installed at a variety of different lengths, and the efficacy of centralisers is based on the distance between each.

### **Cement requirements and compressive tests**

#### **S 102:**

- Once again, specifications have been provided for the type of cement, aggregate and chemical additives that must be used, but as in our comment on S 95 above, no minimum or maximum thickness of the cement is specified.

#### **S102(4):**

- It is indicated that the holder must conduct tests for cement mixtures, without specifying what tests. SANS documents include a plethora of tests required for the construction industry, why not apply these to the oil and gas industry?

#### **S 102 (9):**

- The use of psi as a unit of measure is indicative of the "cut and paste" process that has been applied to produce these regulations. South Africa has used the metric system for many decades and there is no reason to change now. Furthermore the apparent use of US standards, may not be applicable to South Africa, and clearly this has not been considered by the regulator.

#### **S 102(10):**

- The specification that the cement shall have a compressive strength of 1200psi (8273.71 kPa or 8.3mPa) is low. Typical concrete strength for foundation design of residential structures is 15 to 20mPa.

**S 102 (11):**

- Not only hydraulic fracturing: including processes, gasses or fluids incidental thereto.

**S 102(12):**

- It is indicated that the holder, together with the specialist contractors must prepare suitable programmes. There is, however, no requirement placed on the holder to have such a program approved by an appropriate agency of the regulator. The cementing operation is a critical component of the well construction process to isolate the well from the environment. The design and implementation of this aspect must be monitored from the outset. A substantial proportion of well integrity failures documented in the USA are due to poorly designed and conducted cementing operations.

**S 102(14):**

- It is required that the holder must carry out remedial cementing if the cement bond is not adequate. The issue is **how?** To glibly instruct to conduct *remedial* cementing is to deflect responsibility onto the operator. Remedial cementing is unreliable and very often ineffective. Stronger and more specific measures must be applied by the regulator in the event of poor cement bonds. This critical aspect cannot be left to the licence holder to carry out without strong oversight.

**S 102 (15):**

- when and how must it be submitted?

**Casing string tests**

**S 103 (7):**

- how long before the cementing process commences must it be submitted?

**Blowout prevention**

**S 105(6):**

- Reference is made to a well control certificate from an accredited training programme. Such training centres will not be available in South Africa, and can only be obtained internationally. The South African government will therefore have not influence over course content and applicability.

**Well examination**

**S 107(1):**

- It is required that the holder must provide a well examination plan to the designated agency before commencing with drilling **or** hydraulic fracturing. This is clear nonsense because hydraulic fracturing cannot commence before drilling. Should this sentence read "drilling **and** hydraulic fracturing".

**S 107(1)(a):**

- fracture containment. What is fracture containment, does this refer to the hydraulically induced fractures within the petroleum bearing horizon, or is it reference to natural fractures such as faults and joints in the overlying rockmass.

**Drilling fluids**

**S 109(1):**

- when and how?

**Management of operations: General**

**S 110 (2)(b)(v):**

- A full disclosure of fracture fluid composition is required. Disclosure of all chemical compounds must be made and the use of trade names disallowed.

**S 110 (2)(b)(xiv):**

- monitoring of offset wells is required. What is an offset well, a description is not included in the definitions.

### **Hydraulic fracturing report**

#### **S 111(1):**

- Equipment must meet the relevant API standards. Which API standards, specify the documents. The API is an industry based standards bureau, sponsored by the oils and gas industry. Where appropriate South African standards are not available, reference must be made to adopt standards that are not controlled by the industry. EU standards may be more appropriate.

#### **S 111(4):**

- "...must not exceed 95% of working pressure rating..." This implies a 5% margin of error, which is very low. In many geotechnical and civil engineering applications a 50% to 100% margin of error is applied (ie factor of safety of 1.5 to 2.0). The factor of safety applied is insufficient, considering the environmental consequences of failure.

#### **S 111(9)(a):**

- Five years is not adequate. All records must be made available to the designated agency immediately upon completion of hydraulic fracturing, and all monitoring records must be submitted annually thereafter.

### **Mechanical integrity tests and monitoring**

#### **S 112(9):**

- 5 years are grossly insufficient

#### **S 112(10):**

- or otherwise pose a risk to the environment

### **Hydraulic fracturing fluid disclosure**

#### **S 113(1):**

- This is a good provision, but many of these substances are released from rock formations during drilling and fracking as well and would pose a risk. How would this be monitored to ensure that companies comply?

#### **S 113(2):**

- including material safety data sheets, should be disclosed to public as well on easy accessible online platform

#### **S 113 (2)(e) and (f):**

- Comments on S 110 above are applicable here.

### **Fracturing and fracturing fluid containment**

#### **S 114(4)(a):**

- Compromised hydraulic fracturing operations, in which fluids are shown to migrate beyond the target zone must be closed indefinitely. It is improbable that the failure can be remediated as suggested in the regulations.

### **Fracturing fluids management**

#### **S 115(2):**

- and the Department responsible for water affairs

#### **S 115(2)(b):**

- No time limits are applied to the submission of a risk management report. The regulations simply specify that the report must be submitted **before** the commencement of fracking operations. Before may be minutes, hours days or weeks. It must be specified with no vagueness.

**S 115(3)(a):**

- and limit the use of chemicals and harmful chemicals altogether.
- "The holder must, to the extent technically feasible, maximise the use of environmentally friendly additives..." This sentence constitutes a complete and absolute wash out. It is therefore at the discretion of the holder to determine what is "environmentally friendly" and what is technically feasible. In all instances, irrespective of costs all additives must be environmentally acceptable, and the discretion to use the additives must lie with the regulator.

**Management of flowback and produced fluids**

**S 116(2)(f):**

- it should be clarified that "radioactive" includes NORMs

**Transportation of fluids**

**S 117(2):**

- and must be approved before activities commence.

**S 117(2)(a):**

- The transportation management plan must be provided to the Department of Transport as well as the local authorities through who's jurisdiction trucks will travel. The impacts are not only environmental , but also social and may significantly impact upon traffic flow through

towns and communities. Time restrictions must also be applied ie no traffic after 20h00 and before 05h00.

## **Fluids storage**

### **S 118(1):**

- it should be stated that drilling additives are also included
- This paragraph refers to the bunded area around the storage area and it is not clear. Furthermore, temporary holding capacity for the largest container plus an additional 10% is under designed. Greater consideration must be applied to the appropriate volume of fluid that must be contained within the bunded area in the event of an accident.

### **S 117 (7)(a):**

- Samples must be obtained for VOC's etc from each truck load prior to removal from site. How long before departure? What are the consequences of high concentrations of VOC's NORM's etc.

### **S117(7)(b):**

- This makes no sense. The truck is tested and the results submitted to the designated agency. Then what, the truck awaits approval to depart, or it departs with a load of chemical products to the local water treatment plant? A list of maximum concentrations of all organic and in-organic compounds must be provided by the regulator. Any truck load exceeding the maximum permissible concentrations may not dispose of the load at a water treatment facility. These are precisely the reasons why Pennsylvania outlawed the disposal of flow back and produce water at public treatment facilities.

### **S 118:**

- requirements for floor/roof? Containers would otherwise be exposed to natural elements. Should they be fenced, locked and should it be stored under a roof, and on a cement surface?

## **Post hydraulic fracturing report**

### **S 120(1):**

- flowback quality tests are not specified

### **S 120(1)(g):**

- if it was the case.

## **Protection of water resources**

### **S 122:**

This section of the regulations, which have been reduced to 4 paragraphs, is the crux of the fracking debate. No reference is made to the Water Act (1998) or any other applicable legislation. Instead a few vague recommendations are made that the holder must not pollute existing water resources. The experiences in the USA must not be excluded, where confidentiality clauses have made it difficult, if not impossible, for water pollution events to be reported or disclosed.

Full disclosure of all potential water polluting event must be reported immediately, irrespective of volumes of substances involved and distances from surface water resources. Oil and gas companies should not be placed in a position where they police themselves.

In the event of polluted water resources being determined, not confidentiality clause between the land owner and the licence holder may be considered to be legally binding. All operations must cease with immediate effect until the source, type and extent of the pollutants are determined. Remediation of the pollution event and all cost associated with the event are at the expense of the holder. Fracking operations may not resume until the remedial activities have been conducted to the satisfaction of the regulator and an independently appoint specialist agency have verified the efficacy of the remedial actions.

A temporal and spatial scale must also be applied to the pollution of water resources. As in the case of AMD in Gauteng, the pollution of water resources due to industrial activity have taken decades to become apparent, and extend over a large geographical area. Cognisance of these experiences must be applied to all hydraulic fracturing activities.

**S 122(1):**

- must notify the competent authority and Department responsible for water immediately

**S 122(2):**

- directional drilling: does this refer to the horizontal section of the well?

**Water use**

**S 123(3):**

- consider? How will this be verified? Wording is too weak.

**Management of waste: general**

**S 124(1):**

- Waste must be carried out in accordance with applicable legislation. The regulator must specify the applicable legislation, and ensure that all waste management activities are conducted in accordance with the Minimum Requirements for Waste Disposal, failing which, once again, ambiguity will prevail.

**S 124(3):**

- No. The experiences in the USA and Pennsylvania and New York State are not being considered. Public water treatment facilities cannot adequately remove the VOC's and NORM's and this is the reasons why Pennsylvania outlawed the disposal of flow back and produce water at public treatment facilities.

**S 124(7):**

- Drill cuttings must be stored above ground; and then what? Not regulation or guidance is provided as to how the drill cuttings are to be disposed.

## **Management of spillage**

### **S 126:**

- some chemical additives pose a threat even in small quantities – why was a threshold of 50 liters agreed upon? Must be reported immediately

## **Fugitive emissions**

### **S 127:**

- light, noise and air pollution not specified? Authorisation should first be obtained for venting or flaring.

### **S 127(1)(a)(i):**

- Reference is made to section 20 of the Act. Which act? It must be specified.

### **S 127(2):**

- The volume of gas flared must be measure and accounted for. All gas flared must be subjected to carbon tax and royalties paid to the regulator. Emissions of CO<sub>2</sub>/methane and other greenhouse gases as well as the wastage of a petroleum resource by flaring must be accounted for by the state.

### **S 128:**

- No indication is provided how propants are to be transported and stored on site. Similarly no regulations are provided as to how propant contained in flow back is to be treated. This section is woefully inadequate.

### **S 128(2)(a):**

- use of speed restrictions. Dust emissions on roads is subject to the height and length of the vehicle, the type of road surfacing and the maintenance (ie use of dust suppressant) of the road. To glibly refer to speed restrictions without specifications, once again alludes to the lack of consideration applied to these regulations.

**S 128(2)(b):**

- Regular road maintenance. This two word sentence makes no reference to the type of maintenance , the regularity of maintenance or the national standards required to be applied, of which the Department of Transport has many. Furthermore, which roads are to be maintained? Farm roads, local roads, municipal and provincial? Following decommissioning will there be a requirement to rehabilitate unused roads and for what period of time will the holder be responsible for erosion prevention?

**S 128(2)(c):**

- Restrict construction activities during high wind days? *Construction* of what, roads, boreholes or pipelines. *High wind days* provide no regulation or guidelines. A maximum wind velocity must be specified, as well as a direction in the event of adjacent farming or other activities being in the vicinity of the licence holders operations.

**Noise control**

**S 129 (1):**

- No indication of onsite noise control is provided. Compressors, drills, generators, flaring and traffic all contribute to noise. A decibel limit specification of all noise but be provided, that is applied within a specified distance from the well pad and all associated equipment.

**Well decommissioning or closure**

**S 132(2)(c):**

- Comments on S 95(3)(b) are applicable

**S 132 (2)(e):**

- Comments in 95(3)(d) are applicable

**S 132 (2)(h):**

- How long must monitoring continue. The requirement of the monitoring period, procedures and quality control must be specified.

**Schedule I**

Phenol is listed twice, and in the second instance the chemical category and the number of product containing the chemical is omitted.

