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development@iow.gov.uk

Dr Tim Thornton
Middleton Hall
Pickering
YO18 8NX

Having been a family doctor with a concern for public health, I have studied the impacts of oil and gas development on local communities. There has been little new oil and gas extraction in the UK in recent years until around 2010 from which to derive local evidence of health impacts. What little there has been, has come with a range of impacts mainly on community well-being and community cohesion as well as mental health impacts. Where there has been intensive development using modern techniques, often reaching down to the shale, there are concerning reports of harm across a wide range of impacts.

My evidence comes from government data and from peer reviewed literature rather than from government departments, government sponsored reports and industry reports. Most of this 'grey literature' is not reviewed or reassessed when critically appraised and therefore of uncertain reliability.

What is clear from the peer reviewed evidence is that oil and gas extraction comes with a host of unwanted impacts. The impacts can be shown to be related to the distance from the wells, the number of the wells and the activity of those wells.

Particular times of high activity and impacts occur at times of site preparation, drilling and stimulation of the wells and some of the impacts can be seen to be greater during those times. Asthma attacks requiring steroids, inhaled and oral, and hospital admissions showed a marked relationship with the drilling and stimulation phases with up to 4 times increase in attacks requiring interventions. 3

Distance clearly matters as the concentrations of pollutants generally reduces exponentially. Similarly, the health impacts of noise, light pollution have a reducing frequency with distance. What then is an acceptable distance from a well to a residence? The Government Inspector for the Mineral and Waste Joint Plan for North Yorkshire, the National Parks and City of York recognised

the issues and accepted the proposal for 1500 meters setback distance to the nearest 'sensitive receptor'. The final report has yet to be published. The oil and gas industry prefers no fixed distance but to debate each application on its own merit. My opinion is that this distance is less than desirable or safe but it allows the potential for some exploration to take place and if under scrutiny it could be shown to be safe the distance may be adjusted in the light of UK experience. Having a go closer than 1500 meters would not be appropriate. To date no recent Health Impact Assessment has been performed in the UK with regard to Oil and Gas development beyond working with the hopes and expectations of the Industry. Predictions especially of air pollution are often minimised by orders of magnitude. When measured the amounts of methane over rigs and gas fields offshore can be orders of magnitude greater than predicted by Industry and gas has been demonstrated to be deliberately vented onshore. Methane levels measured over the gasfield of the Vale of Pickering are markedly higher than surrounding areas. Gas leaks from all the infrastructure including the wells. While methane is a danger for global heating (around 85 times worse than CO₂ in a 20 year period) it is accompanied in 'natural' gas by a range of other gaseous chemicals that are toxic to humans. Not only are the drilling muds and water likely to be radioactive, the gas can be too. Radon which can be found in the gas is the second commonest cause of lung cancer in the UK. Homes in Pennsylvania were found to be contaminated with radon in relationship to the number of wells, the distances from the wells and the activity of the wells. Hundreds of thousands of homes in Pennsylvania have over the recommended maximum level of radon. The current application uses a setback distance of 350 meters which most authorities would consider wholly inadequate.

Further evidence of harm from oil and gas extraction on health include the Johns Hopkins studies, an increase in prematurity of greater than 3 weeks and complicated pregnancy in relation to wells – 40% increase and 30% respectively related to levels of exposure to wells as above. Also mild to moderate depression, migraine, nausea, lethargy related to exposure. Lisa McKenzie in two papers showed relationship to exposure and congenital heart disease. Recent research shows relationship to the number of flare stacks and activity of the flares with distance on the incidence of premature babies. The effect on early deliveries could be seen in women living up to 5 km away.

When considering if this is a good site for and oil and gas well then you must consider if there are people living or working within a distance that might be impacted by health issues. Greater concern must be given to children

especially pre-school and nursery children. For a number of reasons, they are more vulnerable to pollution and its impacts, they play out more, are close to the ground, their body/weight ratio is different and they have immature processes to cope with pollutants. In a well ordered world, they will live a long time after exposure so that slow presenting disease has a greater chance to reveal itself. Benzene causes lymphoma and leukaemia and is commonly raised around oil and gas installations. Radon is slow to cause lung cancer etc.

Air pollutant should be conditioned so that as near real time evidence of a rise of contamination can be detected and reported to the community for action. Hydrogen sulphide is a common issue with smell, nausea, wheezing and at high levels it can be toxic. As with all other monitoring it should be made available as near real time as possible online.

Alongside the distance relationship to a well it must be recognised that being on a small island carries risk. Acid can be used to soften the rock. Hydrofluoric acid, a potent acid is used by the industry 'because it works'. It would be important to discover what acids are intended and restrict/ban or regulate the use of Hydrogen fluoride or its acid. You may wish to read the CDC listing for it and wonder how you might get off the island should there be a significant release. In a laboratory or controlled environment, it may have a place but the controls may not be adequate to deal with a chemical which causes deep burns, burns the cornea, and can cause near instant death from respiratory failure or cardiac arrest. This is not for the unwary. Glass and metal cannot contain it. <https://emergency.cdc.gov/agent/hydrofluoricacid/basics/facts.asp>

There is a lack of clarity about whether the operations are to look for oil or for gas – hydrocarbons is the term used. As limestone is considered 'conventional' then fracking cannot occur in it, by definition. If less than 1,000 cu m of water is used, it is not fracking, if less than 10,000 cu m of water in the lifetime of the well is used, it is not fracking. It is a common/normal process for the Industry to gradually creep their activity from one level of intervention to the next. They are looking for oil but are preparing to find gas, hence the flaring.

Oil and gas development is accompanied by fear, community disharmony and infighting. It gives hope for some and despair to others and breaks up community cohesion. The promise of enrichment and indeed perhaps a boom, is followed by an overall reduction in jobs, and a reduction of the local economy. This combination contributes to the lowering of mental health and wellbeing. Low mental health leads to an increase in physical health. Poor

people and vulnerable people are more at risk of health impacts from equal amounts of pollution when compared with their wealthier neighbours.

Governments and local authorities have never performed a full Health Impact Assessment on oil and gas development and reviewed the health of a community before and after a development. They rely on the Industry to monitor and report with a tick box exercise as they go along. Noise and light pollution are inevitable and the monitoring does not happen in real time if at all. Protocols for reporting and alerting exceedances are not followed or communicated with the community in a meaningful or timely way. Traffic management plans are not followed and the estimates of lorry and vehicle movements are ignored. The routes that are taken are not controlled and if alternate routes taken then they are not surveyed for safety. The reporting structure must be tight – locally there were three authorities for noise exceedances and it was not possible to identify which should take the lead in which circumstance. The noise monitoring plan was not followed in Kirby Misperton with breaches not documented with no written records as required. I suspect they had the same noise consultants as the current application.

If as a planning authority you wish to exert any influence then all these issues need to be controlled by applying conditions or rejection.

Disposal of the waste streams is an issue that has not been resolved adequately. How will the waste be dealt with particularly the radioactive drilling mud and rock and the radioactive and toxic water that returns up the well? Radioactivity can only be hidden it cannot be chemically diminished. The huge quantity of water for disposal is an issue. The water has been shown to be toxic, carcinogenic, mutagenic and teratogenic as well as endocrine disrupting. There has been no satisfactory method found to make it safe. Hiding it down a well at high pressures (3-4 tons per square inch) test the ability of the well to resist leaking. If it fails, as many do, it can poison an aquifer. There is no known way to clean an aquifer. Yorkshire Water quoted the Industry reassurances when it asserted that well do not leak. Offshore wells that have been decommissioned can be seen to be leaking around the well bore by the streams of bubbles arising. The Industry has known for decades that gas cannot be contained by the well and if gas leaks then so can other molecules. Injection wastes should mean they were non-hazardous to ground water as the original chemicals all have to be. If the wastes come from below the ground the Environment Agency suggest they can be injected back underground without consideration of risks of this toxic soup.

Injection of waste also causes seismic activity – ‘earthquakes’. These increase in time, can occur at any time and any distance from the injection site (up to 20 km) and cannot be predicted. High pressures and rattling about can damage the cement bonds around the well bore and allow communication to the outside world and to water.

Like many oil and gas companies, UKOG is not well financed and hopes to bring an income stream from exploiting resources in Turkey. There is a risk that in time UKOG or subsequent owners will not have the reserves to be able to fund decommissioning of the well and restoration of the site. For six years the PR company UKOOG has said it would look into an industry bond to cover the risk of a company being unable to fund the clean-up. Nothing has been forthcoming to date. The cost to clean up Third Energy’s infrastructure has been estimated between £9 mill to £19.5 mill in a recent High Court case. Should the industry not be able to pay the bill then the Oil and Gas Authority has no power to intervene but the costs would fall on the current landowner. (Please inform them) They would fund ongoing costs of the well leaking etc until insolvent. Thereafter the costs would be carried by the authorities. The barrister for the OGA was unable to specify the organisation but it could be the Minerals Authority who carried the costs, the County Council or BEIS, or another government office that she could not determine as the OGA did not have strong powers or controls.

I note there are no plans to do up to date seismic surveys. They should not be able to drill blind through faults, fissures and into or through aquifers. Cuadrilla failed to interpret their 2D and 3D seismic surveys and twice caused a series of seismic events on their two sites. UKOG should not rely on ‘ancient’ technology that would be inadequate for the purposes of protecting water and from seismicity.

In summary there is a host of reasons why this should be rejected. 350 meters from sensitive receptors is an inadequate separation. No school or nursery should be within 1500 meters nor should a pregnant, or potentially pregnant woman be within that radius either. The handling of waste needs much more clarity if safety is to be considered. ‘To an EA approved site’ is inadequate. You must consider and how the safety of the islanders will be made possible should

there be a major incident and how the communications of the alert system will work to ensure that all can evacuate to a safe distance, or off the island.

All the evidence has come from peer reviewed reports, from government data of publicly available reports. The North Sea methane leaks from unpublished data from overflying gas installations or from methane detecting camera footage. The outcome of the High Court case has yet to be announced although the report is available on Drill or Drop.

In order to meet the deadline, I will submit without detailed references to each statement which can be supplied should you wish.

Most can be found within

Environmental Health Concerns From Unconventional
Natural Gas Development
Irena Gorski and Brian S. Schwartz

Shallow Gas Migration along Hydrocarbon Wells—An Unconsidered,
Anthropogenic Source of Biogenic Methane in the North Sea
<https://pubs.acs.org/doi/abs/10.1021/acs.est.7b02732>

Methane leaks over N Sea rigs p 224 with further personal communication.
Joint US-UK Workshop on Improving the
Understanding of the Potential
Environmental Impacts Associated with
Unconventional Hydrocarbons

MEDACT David McCoy and Patrick Saunders

1st Report

https://www.medact.org/wp-content/uploads/2015/04/medact_fracking-report_WEB4.pdf

2nd Report

https://www.medact.org/wp-content/uploads/2016/07/medact_shale-gas_WEB.pdf

supportive information to 2nd report

<https://www.medact.org/wp-content/uploads/2016/09/Medact-Notes-on-Shale-Gas-September-1.pdf>

The USA document will contain most if not all of my statements.

http://concernedhealthny.org/wp-content/uploads/2019/06/Fracking-Science-Compendium_6.pdf

The science relates to oil and gas extraction using pressure, acid or other unconventional methods.

Pennsylvania 27% increase in admissions

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131093>

Casey and Schwartz Pregnancy outcomes

<https://www.ncbi.nlm.nih.gov/pubmed/26426945>

Lisa McKenzie congenital heart defects

<https://ehp.niehs.nih.gov/1306722/>

Review of Public Health Impacts of Unconventional Natural Gas Development – Patrick Saunders

<https://www.ncbi.nlm.nih.gov/pubmed/27921191>

Professor Ingraffea demonstrating the extent of wells leaking in US

https://www.youtube.com/watch?v=vmr_ETzjGCA

Fracking Minding the Gaps Jo Hawkins examines the adequacy of the regulatory framework 2015

Unconventional Gas and Oil Drilling Is Associated with Increased Hospital Utilization Rates Jemielita 2015

Study: Fracking Industry Wells Associated With Premature Birth. Johns Hopkins News 2016

[Birth Outcomes and Maternal Residential Proximity to Natural Gas Development \(NGD\) in Rural Colorado McKenzie 2014](#)

And finally

Letter from Dr Jerome Paulson (Highly regarded Environmental Paediatrician) to the Pennsylvania Department of Environmental Protection regarding Unconventional Gas Extraction

I am writing in regard to decisions that your office will be making about unconventional natural gas extraction (UGE). Some of these decisions may relate specifically to children, such as decisions about setbacks between UGE sites and schools. Other decisions may relate to UGE in a broader sense. As a physician with significant expertise in environmental health, I want to point out that there is no information in the medical or public health literature to indicate that UGE can be implemented with a minimum of risk to human health.

In protecting children from environmental health hazards, it is essential to recognize that for many reasons children may be more exposed to environmental health hazards than adults in the same location. Moreover, children may have different outcomes than adults similarly exposed. For example, children breathe more air and drink more water per unit of body weight than adults do. Therefore, if the air or water are contaminated, the children will receive a higher dose than the adults. Children also live longer than adults. While that may seem self-evident, it is important in the environmental context because many outcomes of environmental exposures occur years after the exposure. If the delay between exposure and outcome is, for example, 40 years or more, as it may well be in terms of some of the chronic lung diseases of adulthood, if a 60 year old adult is exposed, s/he may not live long enough to develop the adverse outcome. A child, however, will, in all likelihood, live long enough to experience that adverse outcome.

In summary, neither the industry, nor government agencies, nor other researchers have ever documented that UCG can be performed in a manner that minimizes risks to human health. There is now some evidence that these

risks that many have been concerned about for a number of years are real risks. There is also much data to indicate that there are a number of toxic chemicals used or derived from the process, known or plausible routes of exposure of those chemicals to humans; and therefore, reason to place extreme limits on UGE.