

Appendix 17

Public Health

Proposal

The applicant has provided an overview of potential public health impacts relevant to the proposal. The overview is set out as a separate chapter in the Environmental Statement (ES). The applicant also sets out an assessment of any potential public health impacts in each of the various chapters of the ES (e.g., noise, air quality, water, etc.).

In February 2014, Public Health England (PHE) identified a range of public health concerns that should be addressed in the preparation of the applicant's ES. This was in response to the scoping opinion request by the applicant. PHE raised the following points:

- Identification of where within the ES receptors that could be affected by health impacts are identified;
- Highlighting where, within the ES, the impacts from construction decommissioning have been assessed;
- How potential health impacts relating to emissions to air and water have been assessed and where in the ES these are documented;
- Specific issues concerning emissions to air;
- Specific issues concerning emissions to water;
- How potential health issues relating to land quality and contamination have been assessed;
- How potential health issues relating to waste management have been assessed;
- Other health related issues such as the management of pollution incidents, the regulation of the site and how potential public stress and anxiety have been taken into account by the Project; and
- The organisations that have been consulted regarding health related issues during the EIA process.

The following issues have been explored in detail by the applicant in separate chapters of the ES, and have also been summarised in an overview section of the ES on public health (chapter 20).

- Noise;
- Air quality;
- Water (surface and groundwater);
- Perception effects

This report and its appendices similarly makes an assessment of the applicant's proposal in separate sections (e.g. noise, air, water, etc.) and provides an overview in this appendix on public health.

Noise

The site is located away from residential properties. The noise impact of the project has been assessed in the Noise Chapter (Chapter 16 of the ES).

Baseline noise levels have been established by a measurement survey by the applicant. This data is used to assess the potential significance of any effects. The site is in a rural location.

Different stages of the project will have different noise levels. The noisiest activities are most likely to occur within the first two to three years of the. However, the noise levels for all stages of the project have been assessed by the applicant.

The applicant concludes that only stage with the potential to result in a significant noise effect is where hydraulic fracturing occurs during night time (2300-0700) where noise limits are at their most stringent. This will be mitigated by only operating the pumps used (only for up to 3 hours at a time during hydraulic fracturing) during weekday daytime and Saturday mornings. Vibration impacts have been ruled out by the applicant because of the nature of the project, method of construction for the well pad, arrays and pipeline connection for the extended flow testing.

The Roseacre Wood and Preston New Road sites are sufficiently distant from one another that there will not be a combined or cumulative lighting impacts on receptors from both sites.

The applicant has concluded that the Project will not have significant noise effects on the nearest residential properties or businesses.

Air Quality

The applicant has assessed air quality impacts in Chapter 6 and Appendix E of the ES.

The predicted air quality emissions from the Project have been compared to Air Quality Objectives and Limit Values for the different pollutants likely to be emitted by the Project activities (Section 6.7 of the ES). These objectives and limit values are based on minimizing health effects as a result of acute or chronic exposure to potentially sensitive individuals. It is noted that the PM10 levels have been screened out by the applicant as being insignificant

Dust

The applicant concludes that the area has low sensitivity to dust because of its rural nature, there are no receptors within 100m of the site and there are less than 10 within 350m and the local PM10 concentrations are low. The risk of dust impacts is therefore negligible to low.

Furthermore, the scale and duration of the Project activities (construction of the access track and well pad and decommissioning) will not be carried out over a long period of time (less than 2 months for each activity).

Emissions from generators

The applicant has provided details of equipment that will be used at the site, i.e. pumps, fracturing water transfer pumps, generators, blender units and service rigs. The equipment will be used during the drill phases for the duration of the drilling. During the hydraulic fracturing the engines will be run for only a few hours at a time. Given the size of the generators and engines and the relatively short period of operation, these sources have been scoped out of the assessment by the applicant. A table summarising the generators used on site is provided in Appendix F of the ES. Further information was requested from the applicant to justify the decision to remove the generators from the scope of the assessment. This has been provided.

Emissions from road traffic

To assess the impacts from road traffic an initial screening exercise was undertaken by the applicant that examined the likely changes in vehicle numbers on the road and compares these with criteria from the Design Manual for Roads and Bridges (DMRB) to determine whether a more detailed assessment was required. The criteria are not exceeded so no significant air quality impacts are likely, according to the applicant's assessment. Again, further information was requested to justify this decision and this has been provided.

Emissions from the Flare

The Air Quality chapter of the ES (Chapter 6) includes a forecast and assessment of the potential quantity and effects of NORM in the form of gas (specifically radon) that may be present in the gas that is burnt in the flare stacks. These predictions have been compared to an annual dose limit of 300 microSv/yr for a single source. The predicted emissions from the combustion of gas in the flares is 0.3 microSy/yr. This is one thousand times lower than the International Commission on Radiological Protection (ICRP) limit. Therefore, the applicant concludes, the levels of NORM emitted to the atmosphere by the Project do not present a significant risk to health.

The flares that will be used to burn gas generated during initial flow testing are the main source of emissions to air associated with the Project. The concentrations and distribution of pollutants (specifically NO₂ and benzene) have been modelled by the applicant so that the effect on air quality, and indirectly health, can be predicted at potentially sensitive receptor locations around the site (residential properties). The ES air quality assessment concludes that the levels of NO₂ and benzene are well within the regulatory limits and therefore do not present significant risk to health.

In summary the air quality effects from the project have been assessed for dust, NO₂, PM₁₀, PM_{2.5}, benzene and NORM. The assessment by the applicant for all of these parameters has concluded that the emissions from the project will not be significant.

Surface and groundwater

As part of the analysis reported in Chapter 11 of the ES, a review of potable water

abstractions was undertaken by the applicant. There are no surface or groundwater abstractions in the vicinity of the surface or below ground works that are used for potable water. This is based on a review of abstraction points registered with the EA and local authorities.

Potable water within the vicinity of the site is provided by United Utilities by their mains potable water supply.

The applicant states the design of the wells, including multiple layers of containment through the shallow sections of the wells, and the characteristics of the geology below the site means that there are no plausible pollutant pathways between the well and drinking water supplies.

The well pad has also been designed to provide the level of containment required by the Environment Agency's Pollution Prevention Guidelines. This, it is reasoned, in combination with the implementation of the Environmental Operating Standards (See Appendix E of the ES), will minimise the risk of surface spills of potentially polluting materials affecting surface watercourses, soils, crops and animals.

For these reasons the applicant concludes that the risk of a pollutant linkage being created that could then impact on human health is negligible.

Perception Effects

The applicant states that the key health effects raised by residents during the various consultation events prior to submission of the various planning applications are:

- Risk from radioactive materials;
- Risk from flammable gases;
- Risks from the presence of potentially hazardous materials at the site;
- Risk from emissions to air (including flaring);
- Risk from induced seismicity;
- Risk of pollution to ground and surface water
- Road safety and traffic concerns; and
- Concerns regarding potential sensitive groups or individuals (e.g. children or people with pre-existing health conditions).

In order to respond to these issues, the applicant has undertaken or will undertake the following:

- Provided information about shale gas exploration and the processes of drilling, hydraulically fracturing and flow testing wells;
- Undertaken early engagement with the wider community to allow them to communicate their concerns, to feed into the development of an Environmental Risk Assessment (ERA) and then the development of the planning applications for Roseacre Wood and Preston New Road;
- Provided evidence on known risks either as part of the ERA, the ES, other documentation supporting the planning applications and applications for Environmental Permits;

- Develop a programme of environmental monitoring during the exploration works and mechanism to publicise the results and provide affected parties with a means to raise concerns and communicate with the applicant throughout the life of the Project; and
- Development of a framework for environmental management of the site, through implementation of a comprehensive Environmental Operating Standards (see Appendix E of this ES).

Summary of consultee comments and representations

A number of statutory consultees and other bodies have referenced potential health impacts in their responses to the consultation. The responses and representations that specifically reference potential health impacts are summarised as follows:

LCC Director of Public Health: On 6 November 2014 the County Council's Cabinet endorsed a Health Impact Assessment (HIA) of the Potential Health Impacts of the Proposed Shale Gas Exploration sites in Lancashire.

The HIA was prepared by the County Council's Director of Public Health (DPH) to inform the planning, environmental permitting and consenting process by the County Council and the regulatory roles of Environment Agency(EA), Department of Energy and Climate Change (DECC) and the Health and Safety Executive (HSE) respectively.

The HIA concluded that shale gas exploration, like any other industrial activity, has its risks to the health and wellbeing of the population. Having completed the HIA for each of the two sites the DPH has concluded that the key risks to the health and wellbeing of the residents who live near the two proposed sites in Lancashire include:

- Lack of public trust and confidence, stress and anxiety from uncertainty that could lead to poor mental wellbeing
- Noise related health effects due to continuous drilling, and
- Issues related to capacity for flowback waste water treatment and disposal.

The DPH advises that these risks and other issues highlighted in this report can be mitigated by LCC, EA, DECC, and the HSE to protect the health and wellbeing of local residents. In particular:

- There is also a need to be vigilant during the operations, and in emergency preparedness.
- A robust baseline and long term monitoring of environmental and health conditions is required in order to reassure communities and to understand the cumulative and long term effects.
- Local communities should be actively involved and the risks should be communicated in a transparent and reliable manner that is proportionate to the exploratory phase of the industry. This needs a closer working relationship between the industry, national and local agencies as well organisations with an interest in local shale gas exploration.
- If this industry is to develop further, there is a need for shale gas specific spatial strategy at a local level and an onshore oil and gas industry specific integrated

regulatory framework at a national level. Further research on effects of shale gas development on health and wellbeing will help to improve the policy and regulatory framework as the industry moves into production phase

The HIA contains 45 recommendations aimed at range of organisations (e.g., the County Council, the EA, DECC, the HSE, the LGA, the applicant, etc.). Some of the recommendations are relevant to the determination of this planning application, while others relate to the development of the industry more generally. Indeed, Appendix J of the HIA contains 16 recommendations for the County Council in its role as mineral planning authority.

The 16 recommendations are set out below:

1. Consider the need for further noise assessment, particularly on the proposed Roseacre Wood site and if necessary, require additional mitigation measures to reduce noise associated with the development of the sites and more particularly the drilling and hydraulic fracturing phases of the development and which could be controlled by conditions attached to any planning permission.
2. Establish with the Applicant that liability and compensation arrangements are in place to cover any structural damages to properties that can be attributed to an unlikely event of induced seismicity.
3. Undertake an independent verification of the assessment of air quality, transport, waste management and induced seismicity prior to determining the planning applications.
4. Seek agreement with the Applicant to establish an independent comprehensive baseline and on-going long term monitoring of environmental and health conditions prior to any activity on the sites. An indicative framework is described at the end of this document.
5. The Director of Public Health should be informed of the results of the measurements and any breaches to the planning condition or environmental permit.
6. Consider the need to seek further clarification from the Applicant that the cumulative impacts of the operations from the flare, generators, vehicles and drilling will not exceed the national air quality objective thresholds, particularly for PM 10, 24 hour mean levels.
7. As part of either the planning or permitting process, the Applicant should be required to submit regular data on the ambient air quality on site measuring all the common air pollutants relevant to the activity and report them regularly. PM10 and PM2.5 should be reported separately (PM10 stands for particulate matter less than 10 microns in diameter).
8. The Roseacre Wood site is within 55m of a National Grid gas transmission pipeline. Interconnections into national transmission pipelines are proposed at both sites. Advice should be sought and an assessment undertaken as to whether the nearby gas transmission pipelines are considered to be a major hazard.
9. Any extended flow testing provided for by any planning permissions should be aligned with the permits to be issued by the Environment Agency.
10. An assessment of light pollution as part of the site operations should be carried out, and if there are likely to be significant impacts associated with light pollution from the sites that cannot be mitigated or controlled, the Applicant should be

requested to consider the opportunity to offer to fit blackout blinds to those homes most likely to be affected.

11. Further clarification or new information on the occurrence and magnitude of equipment likely to be contaminated with radioactive waste and how such waste would be managed on the site and disposed of should be sought.
12. Should planning permission be granted, it should be a pre requisite that no activity can start until the onsite and offsite waste treatment capacity is defined.
13. Further clarification should be sought that any specific risks due to using the MoD site for accessing the Roseacre Wood site have been addressed before any planning permission is granted.
14. A full assessment of the impacts of additional traffic associated with the proposals on road safety should be carried out and appropriate traffic management options considered to address the public concerns, particularly in respect of the Roseacre Wood site.
15. Should planning permission be granted, provision should be made with the Applicant to maintain road safety, particularly on the access routes to Roseacre Wood site and road safety and any related incidents on the access to both the sites should be monitored.
16. In the event planning permissions are granted, any breach of planning conditions should be reported to the Director of Public Health so that necessary steps can be taken in protecting and improving the health of local communities from issues arising due to the alleged or identified breaches of planning control.

The Director of Public Health has also set out indicative proposals for long term monitoring associated with the project. The aim is to establish baseline and on-going monitoring through a shale gas observatory to:

- Monitor environmental and health conditions
- Support risk communication and reassurance to local communities on the safety and impacts of shale gas activities in Lancashire.
- Govern and manage the observatory in consultation with various stakeholders including the local communities, the industry, and the regulatory agencies.

The DPH believes that establishing a shale gas monitoring unit in Lancashire as an independent source of reliable information will help with the understanding of any environment and health impacts and the communication of risks to the local communities. It will also support the development of future policy and practice of shale gas extraction.

Public Health England: Public Health England (PHE) has sought a number of clarifications regarding the planning application in two separate consultation responses. In turn, the clarifications and questions contained in both PHE responses have been satisfactorily addressed as a result of further information or clarification provided by the applicant.

In nearly all cases, the applicant has clarified how and where the PHE comments are addressed in the Environment Statement submitted with the planning application. Many of the clarifications requested by PHE are already addressed in the ES, or are controlled by the Environment Agency through the permit process.

PHE conclude that although onshore oil and gas extraction and related activities have the potential to cause pollution to air, land and water, the currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with such extraction are low if the operations are properly run and regulated.

Based solely on the information contained within the application provided, PHE has no significant concerns in relation to the potential emissions from the site adversely impacting the health of the local population from this proposed activity, providing that the applicant takes all appropriate measures to prevent or control pollution, in accordance with the relevant sector technical guidance or industry best practice.

PHE agrees with the proposals to undertake baseline monitoring of ground waters, surface waters and local air quality to better assess the impact on the environment from any development.

However, it says the details of the baseline monitoring prior to operations need to be provided to ensure it will allow assessment of the impact of operations on the local environment. Baseline monitoring, and on-going monitoring, is a requirement of the EA draft permit as set out in the Waste Management Plan (which is part of the permit). In addition, a pre-operational condition of the draft permit requires the applicant to obtain written approval from the Agency for an Environmental Management and Monitoring Plan (EMMP) at least 4 weeks before commencement of the gas flaring activity. This will include details of the baseline air quality study undertaken before activities commence, together with details of the ambient air monitoring programme proposed during and after the period of gas flaring.

PHE say the levels of radon are very small and there are no grounds for concern about the potential radiological impact of radon arising from the proposed activities. Similarly, on naturally occurring radioactive material (NORM) PHE confirm the dose is significantly below PHE's recommended level and is not a concern.

Fylde Borough Council: Objects to the proposal on the grounds that it is contrary to Policy DM2 of the Minerals and Waste Local Plan and Policies EP12, EP26, EP27 and EP28 of the Fylde Borough Local Plan, which are considered to be in conformity with the provisions of the National Planning Policy Framework.

The proposed drilling operations would result in the introduction of considerable traffic onto the rural highway network and would require alterations that would detract from the character of the rural area and cause significant environmental harm, particularly given the distance from the primary highway network and the uncertainty surround the alternative access arrangement through HMS Inskip. In addition to the noise and general disturbance from 24hour drilling operations and associated activity that would be significant, as would the impact on Roseacre Wood.

The County Planning Authority should be also be satisfied that the below and above ground operations will not have any significant adverse impacts in respect of Policies SP2, TR9, TREC10, EP10, EP11, EP13, EP14, EP15, EP18, EP19, EP21, EP22, EP23, EP24 and EP25.

The Councils Environmental Protection Team has advised and made recommendations as follows:

- The exclusion of a sensitive noise receptor in the applicants noise report may mean current calculations are artificially elevated resulting in the prediction that noise levels will not exceed current background levels.
- Recommend that the applicant ensures that there are continuous sound level monitoring at the nearest residential property to ensure sound levels accord with WHO guidelines.
- Recommend that no HGVs arrive at or leave the site between 23:00 and 07:00.
- The sound levels are currently less than WHO guidelines so residents may experience an increase in noise. Ideally criteria should be set such that “as a result of the activity at the site no dwelling shall experience sound levels that are more than 5dB above current background levels between 07.00 – 23.00 and no increase in background level between 23.00 and 07.00”
- Recommend continuous monitoring of air quality as a result of increase in road traffic to demonstrate that AQ guidelines are being met, alongside EA monitoring of air pollutants from chemicals and flare burn off.
- Recommend dust significance should be reclassified from medium to large, due to a large site size and increased HGV movements on the roadways, with further mitigation measures to be implemented
- Recommend a plan to be provided detailing the predicted lux levels originating from the site to the vicinity. As a rural area, which is very dark at night, any increase in illumination will be more prevalent. Lighting should only be permitted as the minimum needed for security and/or working purposes and that it minimises the potential for obtrusive light from glare or light trespass to an acceptable level and in accordance with guidance for mineral sites.

Fylde Borough Council subsequently provided a copy of a noise impact assessment on wintering birds, at the Annas Road Exploration Well site, which concludes that the noise from drilling operations will be essentially steady in character, producing decreasing levels from 58 – 42dB(A) in relation to increasing distances between 50m to 500m from the boundary of the well site. The Environmental Protection Team have noted that the survey data shows that the impulsive sound could be up to 16dB greater than the background noise in addition to the drilling operation. The impulsive noise levels are not included in the EIA report for the Roseacre site.

Elswick Parish Council: An initial objection to the proposal was withdrawn. The Parish Council does not object but has the following comments:

- In favour of the preferred traffic route which enables Elswick, a densely populated area to remain outside the routing of the tankers, ensuring the safety of over 200 children living in the village.
- A small group of residents have expressed concerns regarding the visual impact and character of landscape and the risk of methane/water contamination and environmental impacts.

Medlar-with-Wesham Parish Council and Kirkham Town Council: Object to the proposal as submitted and requests that it be refused planning permission for the following summarised reasons:

- The potential major problems outweigh the benefits.
- The Chartered Institute of Environmental Health has highlighted shortcomings of the regulatory system regarding local environment and public health risks.
- Potential for earth tremors despite the traffic light system. Tremors can damage property and associated services including septic tanks. Any damage to underground services could result in watercourse pollution.
- Air pollution from gas emissions. Flaring can lead to over 250 pollutants including methane.
- Potential well failure and the huge potential for land contamination, particularly to aquifers and agricultural land.
- Light pollution from the 24hour operation.
- Potential flow back water site leakages and spillage during disposal and transportation.
- No information on water treatment plans. Where will flow back water be treated and will any new treatment plan accept waste from other UK sites.
- Increasing vehicle movements, particularly HGV's will exacerbate existing problems along the A585 and at the M55 Junction 3 at peak times.
- Increase in ambient noise levels from the continuous operation of this site and any future sites in the parish.
- Potential impact on resident's water supplies.
- The visual impact of the development cannot be minimised.
- Detrimental impact on property values and insurance premiums.
- Concern regarding future site expansion for production following exploratory phase. An increase in well heads will lead to further noise, traffic and pollution.
- Impact on local Wildlife including wintering and migrating birds, birds of prey, game birds, garden birds and bats from increased noise, traffic and lighting.

Newton-with-Clifton Parish Council: Objects to the proposal as submitted and requests that it be refused planning permission for the following reasons:

- The 'Wharles route' along Lodge Lane, Clifton Lane and Station Road is considered unsuitable for the projected number and type of HGVs and if approved is detrimental to highway safety and parish amenity
- The suggested routes has several potentially hazardous sections to highway safety and is lacking a sufficient number of constructed passing places
- The route comprises a dangerous right turn exit from Lodge Lane, Clifton onto the A583 which could adversely affect highway safety
- Clifton Lane/ Lodge Lane in Clifton is in close proximity to a children's recreational park and children have to cross the road to access the park. The proposed increase in type and volume of traffic is clearly hazardous to their highway safety.
- The site access/egress through Elswick is shorter in distance and as a consequence a reduced environmental impact.

Roseacre, Wharles and Treales Parish Council: Objects to the proposal for the following summarised reasons:

- Contrary to Policy SP2 and NPPF due to the huge industrial scale, associated utilities and infrastructure and thousands of HGV movements on narrow lanes
- Cuadrilla has not adequately assessed alternative sites. The development should be located in a SP1 site which has appropriate infrastructure.
- The need for mineral extraction has not been demonstrated
- Contrary to NPPF and CS5 as mineral development should have no adverse impacts on natural environment and human health.
- Cumulative effects for this site with Preston New Road and other potential sites have not been assessed.
- Not sustainable development due to location, road restrictions, water supply issues, permanent waste repository and lack of suitable waste treatment
- Regulations are not robust to provide adequate protection. The safe operation of shale gas operations is not yet assured
- Contrary to Policy EP26 and CS5 as the flare will emit 15,000 tonnes of methane and there is no mitigation for the health hazards of particulate matter
- Contrary to NPPF as it will not support a low carbon future
- Air quality monitoring regime is not acceptable. Need baseline data and real time publicly available data on a range of pollutants and the combined impact of flaring, fugitive emissions and equipment and transport emissions.
- Evidence from USA, America and UK Breast Cancer charity regarding emissions and risks to human health.
- Dust assessment is inadequate and does not take account of construction and daily utilisation of passing places through Wharles and Dagger Lane.
- Contrary to Policy EP27 and SP9 as it will not meet required noise limits and will have an adverse impact on the amenity of local residents.
- The baseline noise measurement is inadequate and the minimum approach for assessment of noise impact should be BS4112.
- Noise impacts on Stanley Mews have not been considered.
- There is no need for 24hr a day drilling, as per the UKOOG website guidance
- Drilling noise levels might be exceeded, so need real time monitoring, with immediate enforcement if levels are exceeded.
- HGVs will have significant noise impacts causing health and wellbeing impacts including daytime nuisance and sleep disturbance.
- Contrary to Policy EP28 due to sky glow. As no mitigation is possible night-time operations should not be permitted.
- Drivers will have loss of visibility from glare from the installation.
- Contrary to Policy CL1 which requires minimal potable mains water in new developments with a need to recycle and conserve water resources.
- Potential water supply problems water required is higher than estimates.
- If tankered water is required, it will increase traffic and emissions.
- Water supply route re-zoning infers potential impact to Roseacre and Wharles
- Contrary to Policy EP25, treatment facilities are inadequate/ not available as there are no authorised treatment sites in the Northwest and proposed sites have insufficient capacity. Waste should not be transported great distances.
- Contrary to Policy CS9 as fracking fluids will create permanent waste on site

- Flowback fluid calculations are disputed. Higher rates and no suitable disposal could result in risk of breach of the well pad containment area.
- The development is a harmful hazardous installation. Radioactive chemicals, including NORM are in flow back fluid chemicals.
- Contrary to Policies EP10, EP23, EP24, EP30 and CS5 as the development will not protect ponds, watercourses, groundwater or natural resources and will increase surface run off, resulting in poorer air and water quality.
- Any spills, well blowouts, accidents or releases into local drainage ditches (and wider watercourse system) poses could contaminate surface and groundwater. Monitoring will not mitigate due to lead times for test results.
- Risk of imperfectly sealed wells leaking into groundwater.
- Seismic activity could cause wells to leak and the heavily faulted geology could create pathways for seepage of fluid and gases into aquifers.
- Storm weather could increase surface water drainage volumes with risks to site containment and potential discharge of contaminated surface run-off.
- Contrary to Policies EP15, EP19 regarding impacts on protected species
- No surveys of barn owls and brown hare and surveys for water vole and badger taken outside of recommended survey times.
- Wintering birds and the functional link between designated sites has not been considered, a full habitats assessment is needed.
- Adverse impacts on rural tourism, leisure and countryside character.
- Visual impact of the development could be reduced by enclosure of site works, horizontal rig and a waste methane generator instead of a flare stack.
- Local planning authority should support a thriving rural community, but this development will have an adverse impact on local communities.
- Local community is fearful for the future with adverse impacts on health and wellbeing, community cohesion and quality of life.
- Decline in house sales, if unable to sell cannot move on to next life stage.
- Health risks from carcinogenic silica, benzene, particulate matter and volatile compounds. Potential early mortality, asthma, stroke, heart disease, fertility issues, neural tube defects, congenital heart defects and low birth weights.
- HGV traffic volumes will have an unacceptable adverse impact on the community through air and noise pollution and general nuisance.
- Strongly dispute existing and proposed traffic data in comparison to own parish traffic survey and predictions, with particular regard to HGV requirements and movements throughout the life of the development.
- HGV movements could be higher subject to HGV availability and the quantity of construction materials, water and flow back fluid to be transported.
- The proposed HGV route is unsuitable with restricted sight lines, narrow carriageways, poor road surfaces and no kerb edgings.
- It is physically impossible for HGVs to go round corners without traversing centre line or all of the road in some places along the proposed route.
- Significant safety and conflict risks to all road users including walkers, cyclists, horse riders, children/pushchairs, mobility impaired, and for those accessing local farms, businesses and schools including Salwick School.
- Concern regarding impacts at Wharles village, Shorrocks Cottage, Dagger Road, Salwick Road, Station Road, Moss Lane East and Roseacre Road,
- Traffic increase to Roseacre Road, Inskip Road, Dagger Road will cause significant congestion and hazards to pedestrians and cyclists.

- Potential conflict between HGVs and agricultural machinery e.g. Dagger Lane
- Traffic especially HGVs should be using the primary route network.
- Traffic access and exist should be confined to DHFCS Inskip.
- HGV movements should be restricted to 09.30-15.00hrs.
- Contrary to LTP objectives of safe and punctual travel between home and workplace and sustainable transport.
- Passing places for HGV will be restricted at all points along the route and proposed passing places are not suitable or in keeping with the surroundings.
- No consideration of utilisation of passing places at Wharles and Dagger Lane.
- Poor and hazardous road surfaces will be made worst by daily HGV use
- Potential cumulative effect with Westinghouse traffic and displacement of Salwick traffic over canal bridge and conflict at Treales near the school.
- No route identified for oversized vehicles during mobilisation / demobilisation.
- Safety recommendations of HIA, RS, PHE not implemented.

Roseacre Awareness Group (RAG):

- Not addressed harm to residents living near to fracking sites, do not want to be guinea pigs to fracking industry. No reference to US health findings.
- Impacts on residents at Roseacre, Wharles and Stanley Mews residents need to be considered, including stress and anxiety.
- Emissions from site and traffic will affect resident's health and wellbeing including children and elderly residents. Evidence from the US, Breast Cancer UK and the media of health impacts.
- Particulate matter poses a significant health risk. Representations that statutory Air Quality reduction targets for PM2.5 will not be met, where schedule 7 defines a reduction target of $PM_{2.5} > 8.5 \mu g/m^3$

Ribble Estuary Against Fracking

- Peer reviewed studies show impacts on health.

Residents Action on Fylde Fracking (RAFF)

- Geological faults can provide a pathway for fracking fluid to migrate to shallow and surface waters.
- Acrylamide is a hazardous chemical used in fracking that can reach the surface in the same concentrations as it is at depth

Roseacre Awareness Group

- Noise and light pollution will affect health.
- Scientific studies prove health risks.

Residents of Roseacre

- Particulate matter less than 2.5 microns (PM2.5) estimated at 9.25 tonnes per year. PM2.5 poses a significant health risk.

- Lighting pollution will have a large adverse impact
- Noise impacts and traffic impacts will be substantial.

Friends of the Earth (FOE): Object. The public health section of the ES does not review the evidence on the adverse public health impacts of unconventional gas, nor acknowledge that the development of the industry has outpaced the knowledge about health impacts.

FOE cite a number of health studies as a growing body of the negative impacts of shale gas on health:

- Concerned Health Professionals of New York has published a compendium of scientific, medical and media findings demonstrating risks and harms of tracking, which references over 300 pieces of research.
- A US National Institute of Environmental Health Sciences study which found a correlation between intensity of shale gas development and heart and neural defects in newborns, within a 10 mile radius of maternal residence.
- A pilot study from the US Centres for Disease Control and Prevention found dangerous levels of human exposures of benzene from shale gas sites, which is known to leak from wells, along with methane, during drilling and tracking operations.
- Breast Cancer UK has reviewed the evidence on health risks and the chemicals used in drilling and tracking fluids and concluded that "Breast Cancer UK has strong concerns about the potentially adverse health effects of increased exposure to harmful chemicals as a result of tracking".
- The US National Institute for Occupational Safety and Health (NIOSH) identified exposure to silica (from sand used in tracking process) as a health hazard to workers conducting some hydraulic fracturing operations during field studies.
- The Umweltbundesamt (German Federal Environment Ministry) has found that "there is great lack of basic information that would be needed for any well-founded assessment of the pertinent risks and the degree to which they can be controlled by technical means".

FOE also question the impact of the proposal on cycling and walking in the area; the decision to leave air emissions from the generators out of scope of the ES; and the track record of the applicant.

FOE submitted a second representation on 19 December 2014. The public health aspects of the representation are summarised as follows:

- Peer reviewed medical evidence from the USA and other countries on the impacts on health of shale gas extraction cannot be ignored
- Reference is made to research by the Council of Canadian Academies and by Physicians, Scientists and Engineers for Healthy Energy from North America which indicate adverse health impacts.
- The ES does not review the evidence of known and unknown adverse public health impacts of unconventional gas. The industry is evolving quicker than the research into health impacts.

- Occupational health not addressed despite US evidence of harmful effects to workers from air quality, waste, wastewater, fracking fluid.
- Fracking fluid information is vague and there are no details of chemicals in the drilling fluids.
- The community profile does not include vulnerable communities in the immediate vicinity of the site.
- Relevant data on demographics and deprivation in Blackpool is excluded.
- Impacts on physical activity have not been considered. HGVs carrying drilling and fracking chemicals and hazardous wastewater may deter cyclists and pedestrians using local roads.
- Air quality assessment should include fixed point sources of air emissions (e.g. generators).
- Cuadrilla has overstated safety claims, through misleading advertising, exaggeration and subjective claims.
- US evidence of negative health impacts of shale gas development.
- US evidence of heart and neural defects in newborns within 10mile radius of maternal residence to shale gas developments.
- Dangerous levels of human exposure to benzene.
- Exposure to silica as a health hazard to workers.
- Breast Cancer UK expressed strong concerns about the potential adverse. Health effects from exposure to harmful chemicals as a result of fracking.
- Germany environment agency has stated that there is a lack of information to assess risks and how they can be controlled.
- The impact on health has been well-identified by Medact, which is critical of the failures of the Public Health England report.
- Operator has a poor track record in running operations properly.

Medact: Is a public health charity whose members are public health specialists. Medact has produced a position paper on the health effects of hydraulic fracturing in the UK. Medact say the risks and serious nature of the hazards associated with fracking, coupled with the concerns and uncertainties about the regulatory system, indicate that shale gas development should be halted until a more detailed health and environmental impact assessment is undertaken.

Representations

The following is a summary of the issues raised in representations that refer specifically to public health:

- Irresponsible to consider fracking in the UK until prospective studies have been completed and the cumulative health impacts of fracking have been determined, need proof of no adverse health impacts.
- Proven adverse impact on human health, leading to other countries banning it
- We do not want to be human guinea pigs.
- Contrary to NPPF which states that local authorities should ensure that mineral development does not have unacceptable adverse impacts on human health.
- Potential for 120 fracking sites in the Fylde meaning many people will fall into high risk category for health impacts, which is contrary to Policy EMP5 regarding risk from hazardous installations.

- Health impacts to family from living in the vicinity of the site.
- People have a human right to remain safe.
- Full short term and long term public health effects are unknown.
- Growing evidence of serious risk to human health.
- American reports have linked air pollution/gas flaring, contamination and groundwater contamination from shale gas developments with health impacts in individuals within a radius of 10 miles.
- US shale gas air pollution reported to have 50 hazardous chemicals of which 35 affect the brain and nervous system.
- In New York State a 3 year moratorium on shale gas followed a report from hundreds of health professionals regarding health impacts.
- Lancet, British Medical Journal and the Medical Journal of America have linked the proximity of shale gas sites with increased health risks.
- Lancet article reported insufficient regulations to safeguard public health.
- NHS website states that the gases emitted are highly toxic and cancer inducing.
- Breast Cancer UK has reported that fracking chemicals are linked to an increased risk of breast cancer.
- The risk to human health is frightening, Lancashire residents are terrified
- The council should protect people's lives and not destroy them, it's too dangerous to risk the health of local people.
- People will get sick and die, it will be a living hell.
- Fracking is very scary/ terrifying.
- Need before and after baseline check on residents health.
- What damage will be done to children's health growing up with fracking
- Reported health risks from living in the vicinity of fracking sites include neurological conditions (brain damage, memory problems, sensory conditions), cancer, breast cancer, leukaemia, heart disease defects, respiratory problems disease, asthma, infertility, stillbirths, neural tube defects, congenital heart defects, reduced Apgar scores for newborn babies, low birth weights dermalogical conditions (skin rashes), chemical burns, poisoning, sickness, weight loss, stress, emotional distress and sleep problems.
- Risk of exposure to sulphur dioxide, polyaromatic hydrocarbons, radon and particulate matter which have health implications.
- Risk of exposure to carcinogenic gases (benzene) neurotoxins (toluene) and central nervous system impacts (xylene).
- Elderly residents (including Carr Bridge residents) with respiratory conditions including COPD, asthma and heart problems have moved to the countryside to improve their health and life expectancy, but now concerned that the development will affect their health, particularly from methane which is an asphyxiate
- Potential for toxins to enter the food chain risking starvation and death.
- Silica sand can cause pulmonary, lung cancer and cardio vascular diseases.
- Blind people will not be able to see that water is discoloured.
- Concerned about health impacts especially to children.
- Impact of constant noise on people's physical and mental health.
- Health impacts will cause a strain on the NHS as people become ill.
- Need to think about present and future generations including elderly and younger generation's safety.

- The EIA does not consider impacts on humans.
- There are no guarantees that the health of local people will not be adversely affected. No decision should be made until a Health Impact Assessment (HIA) / investigation into health risks (supported by empirical data) has been completed.
- Regulations can't mitigate against health impacts from accidental waste spillage and well failure.
- No amount of money is worth the risks of the health of the community.
- Will Cuadrilla pay compensation for health impacts?
- The proposal is contrary to NPPF Paragraphs 120 and 144 as it poses a considerable risk to human health.
- The proposal is contrary to Policy EMP5 as US studies show an increase in cancer caused by chemicals produced during the fracking process chemicals in the air make it contrary to health.
- Who will compensate us for health and wellbeing impacts?
- Impact on leisure pursuits.

Policy

National Planning Practice Guidance states that the range of issues that could be considered through the decision-making processes in respect of health includes, among other issues, how potential pollution and other environmental hazards, which might lead to an adverse impact on human health, are accounted for in the consideration of new development proposals.

Policy DM2 of the JLMWLP states that development for minerals operations will be supported where it can be demonstrated that all material social, economic or environmental impacts that would cause demonstrable harm can be eliminated or reduced to acceptable levels. In assessing proposals account will be taken of the proposal's setting, baseline environmental conditions and neighbouring land uses, together with the extent to which its impacts can be controlled in accordance with current best practice and recognised standards.

Policy EP27 of the Fylde Borough Local Plan states that development which would unnecessarily and unacceptably result in harm by way of noise pollution will not be permitted. Where appropriate, planning permission will be granted subject to conditions to minimise or prevent noise pollution.

Assessment of Impacts

The County Council's Director of Public Health has provided specific advice to inform the planning process and provide public health advice to protect and improve the health of local residents living near the proposed shale gas exploration sites of Preston New Road (planning application numbers LCC/2014/0096 and 0097) and Roseacre Wood (planning application numbers LCC/2014/0101 and 0102). The advice was published as a Health Impact Assessment (HIA) in November 2014.

The Health Impact Assessment makes 45 recommendations to a broad range of agencies, suggesting actions before, during and after any permissions or permits are granted. Appendix J contains 16 specific recommendations to inform this planning process.

Given the advice is specific to this application, it is appropriate that an assessment is undertaken in relation to each of the 16 recommendations in Appendix J.

1. *Consider the need for further noise assessment, particularly on the proposed Roseacre Wood site and if necessary, require additional mitigation measures to reduce noise associated with the development of the sites and more particularly the drilling and hydraulic fracturing phases of the development and which could be controlled by conditions attached to any planning permission.*

2. *Establish with the Applicant that liability and compensation arrangements are in place to cover any structural damages to properties that can be attributed to an unlikely event of induced seismicity.*

The applicant has provided a letter of confirmation from their insurance brokers (Willis Energy). This confirms Cuadrilla Resources Ltd (Cuadrilla):

- Purchased Third Party Liability insurance on an industry standard policy form which will respond to valid claims for their legal liability for loss or damage to third parties.
 - Willis Energy have benchmarked for Cuadrilla the limit of liability purchased by other onshore Oil and Gas operators with similar type and scale of operations and found Cuadrilla's limit to be in the upper quartile of this group.
 - For the avoidance of doubt this policy covers Cuadrilla Resources Ltd and all subsidiaries including Cuadrilla Elswick Ltd and Cuadrilla Bowland Ltd.
3. *Undertake an independent verification of the assessment of air quality, transport, waste management and induced seismicity prior to determining the planning applications.*

Air Quality.

Lancashire County Council Scientific Services (LCCSS), Ricardo AEA, and the Environment Agency carried out a review of the air quality chapters (including radon) of the Environmental Statements.

The LCCSS review concluded that the documents provide sufficient detail to show that the companies have carried out the assessment in a satisfactory manner and that the conclusions drawn from the assessment are valid.

The review found that the documents for both sites identified the following emissions from the activities before, during and after operations: fugitive dust, nitrogen oxides and particulate matter, volatile organic compounds (VOCs) and odours.

The review suggested there are other potential pollutants not mentioned in the assessment which may adversely affect air quality. These include sulphur dioxide, hydrogen chloride and other potentially carcinogenic VOCs. It was suggested that the assessment should explicitly consider these chemicals, but if the consideration concludes these chemicals are of little or no concern this should be confirmed. Further information has been provided by the applicant in relation to these points:

Sulphur Dioxide & Hydrogen Chloride

Results of testing of gas from Cuadrilla's Preese Hall well did not detect any sulphurous compounds or chlorine compounds in the gas. It is therefore assessed as very unlikely that there will be any significant concentrations of sulphur dioxide or hydrogen chloride in the gas produced at the proposed site. Monitoring of the gas quality will be undertaken once the site is operational. This will mitigate the risk of any unexpected pollutant emissions going undetected. In addition, the EA permit (which incorporates the Waste Management Plan) provides for ambient sulphur dioxide monitoring.

VOCs

The air quality assessment has identified the most significant VOCs (volatile organic compounds) as benzene and benzo[A]pyrene (BaP) (selected to represent carcinogenic VOCs). The main pollutants of concern which are included in the air quality objectives are benzene and BaP (Benzo[a]pyrene). The benzene results are included within the ES, section 6.7.5.

BaP: Due to limited amounts of information on polycyclic aromatic hydrocarbons (PAHs) being available in the UK, for the assessment at Preston New Road and Roseacre Wood a precautionary approach has been taken by the applicant by making assumptions based on data from Alberta, Canada. The information has been used to determine the emissions of BaP that could potentially result in a breach of the UK objective for BaP (0.25ng/m³ annual mean).

Analysis undertaken by M.Stroscher et al looking at the composition of flare gas from natural gas extraction sites in Canada has been used for the assumptions made for the Preston New Road and Roseacre Wood sites, which in discussion with the EA considered the best source of information regarding BaP content of shale gas.

The applicant has made a worst case assumption for Roseacre Wood in the ES (chapter 6) that assumes that C6 hydrocarbons constitute 0.1% of the total emissions. The Alberta report indicates that BaP is around 1/1000th of the amount of Benzene. Using this as the worst case assumption, the potential contribution from the Roseacre Wood site can be calculated. Based on this approach the highest predicted annual mean concentration is 0.0224 ng/m³ which is well below the UK objective (0.25ng/m³).

In summary, the findings in the ES and the further information submitted by the applicant conclude that the risk of any impacts of VOCs emissions from the flare on local receptors would be not significant.

In addition, the EA permit (which incorporates the Waste Management Plan) requires ambient monitoring of VOCs and BTEX (benzene, toluene, ethylbenzene, and xylenes) and indirect monitoring of the flare of VOCs among other chemicals.

The EA has undertaken its own detailed assessments of the emissions to air that will arise from the flow testing operations (i.e. from the flare) and the potential impact of these emissions on human health and ecological receptors.

Detailed air dispersion modelling has been carried out by the EA. This considered the potential impacts of the main pollutants that could be emitted from the combustion of natural gas based on its expected composition:

- Oxides of nitrogen / nitrogen dioxide
- Benzene (a volatile organic compound)
- PAH emissions (a reference to benzo-a-pyrene)

Particulate emissions have been covered by a qualitative assessment as the Agency would not expect particulate (PM10) to result from gaseous emissions.

Sulphur dioxide (SO₂) was not included in the EA's assessment because the applicant provided information based on other gas extraction locally that no hydrogen sulphide (H₂S) has been identified during monitoring of the drilling muds or gas.

Having undertaken a detailed assessment, the EA is satisfied that the emissions from the flare would be insignificant at locations closest to the site.

In terms of public health impact of the flare emissions, the EA's audit checks, modelling and sensitivity analysis confirms there will be no breach of standards established for human protection. Indeed, the modelling assumed the flares would be operating for 24 hours, 365 days per year per well. The actual proposal is for the flares to operate for no more than 90 days per well.

Transport

The County Council's Strategic Highways Planning Manager has assessed the applicant's transport assessment. With consideration for all the information provided, he cannot support the application for Roseacre Wood in respect of the transport impacts.

Waste Management

Under the Mining Waste Directive, an operator of a mining waste operation must draw up a waste management plan (WMP) for the minimisation, treatment, recovery and disposal of extractive waste.

The EA has assessed the applicant's WMP and approved the plan as a whole, subject to conditions in the permit. The EA is satisfied that the permit requirements, including the requirements of the WMP, will protect the environment and that the Mining Waste Directive is met.

Induced Seismicity

The County Council commissioned AB Consulting (Edinburgh) to undertake an assessment of induced seismicity of the planning applications for Roseacre Wood and Preston New Road.

AB Consulting (ABC) reviewed the ES submitted by Arup, on behalf of the applicant, and presented a number of questions on key issues in order to seek clarification. Arup then responded.

A discussion meeting then took place between Arup, Cuadrilla, and ABC, providing the opportunity to better understand the background to these exchanges and clarifications.

Through these exchanges more clarity on the key issues was identified to the extent that ABC is satisfied with the applicant's proposal to manage induced seismicity.

- 4. Seek agreement with the Applicant to establish an independent comprehensive baseline and on-going long term monitoring of environmental and health conditions prior to any activity on the sites. An indicative framework is described at the end of this document.*

The Royal Society/Royal Academy of Engineering report 'Shale Gas Extraction in the UK' (2012) recommends that monitoring arrangements should be developed to detect possible well failure post abandonment. The report says that continuous ground gas monitoring and aquifer sampling could be similar to that carried out before and during fracturing operations. Temporary monitoring equipment could be used, such as that used to monitor emissions from landfill sites or even semi-permanent monitoring stations could be installed. The report suggests that monitoring would be at a reduced frequency, perhaps every few years, but says this requires techniques that can reliably distinguish between methane from non-shale operations in the areas of abandoned wells.

The report recommends:

"Arrangements for monitoring abandoned wells need to be developed. Funding of this monitoring and any remediation work needs further consideration."

The applicant has agreed to undertake baseline monitoring before the project starts. Indeed the EA permit requires monitoring for a period of three months before operations commence. The EA requires over 50 determinants to be monitored for air, surface water and ground water.

Post decommissioning monitoring will require the operator to provide sufficient evidence to satisfy the EA that, following decommissioning of the well, there will not

be any unacceptable residual, on-going impacts on the environment before surrender of the permit would be accepted by the EA. Monitoring at the site will therefore continue into the post decommissioning period and will have to demonstrate this. The EA's powers to set monitoring requirements are also more flexible than planning conditions or a section 106 legal agreement because any requirements imposed by the EA may then be adjusted by it according to conditions at the site and monitoring data derived at the time.

A planning authority's reliance on other (non-planning) regulatory bodies to provide the appropriate controls and conditions in relation to their statutory responsibilities has been established through the courts on many occasions. Most recently it was re-confirmed in the Balcombe Judgment (Frack Free Balcombe Residents Association v West Sussex County Council– 5th December 2014). Paragraph 102 of the judgment is particularly relevant:

“the existence of the statutory regimes applied by the HSE, the EA and the DECC shows that there are other mechanisms for dealing with the very proper concerns which the Claimant's members have about the effects on the environment. The Claimant and its members' concerns are in truth not with the planning committee's approach of relying on the other statutory regimes, but rather with the statutory bodies whose assessments and application of standards they disagree with. That does not provide a ground of legal challenge to the decision of the planning committee.”

In light of this judgment as well as national guidance (NPPF paragraph 122) it is not appropriate to impose planning conditions or a section 106 legal agreement with respect to matters, such as longer term monitoring, that are within the remit of other regulatory regimes.

Nevertheless, while there is a question around the appropriateness of using a planning condition or section 106 agreement to provide for such monitoring, the County Council would welcome a voluntary agreement with the applicant to provide for such in the event of a recommendation to grant permission.

The Director of Public Health's locally commissioned Health Impact Assessment has highlighted potential health impacts arising from a perceived mistrust of the regulatory bodies involved in the process. He has recommended that an independent monitoring body should be set up – supported by funding from the applicant. This body would be intended to be an additional independent repository for all of the information collected (both environmental and health related) – enabling a single point of reference and providing independent, easily understandable interpretation of the publicly available data.

The proposed arrangements, if planning permission is granted, would include data and information collected by other agencies and would not seek to be a replacement of the functions provided under other statutory provisions. It would provide the local repository and independent interpretation of monitoring data as well as filling any missing gaps that may be required to provide local reassurance. Local governance of the monitoring arrangements would provide the reassurance to the local communities.

So far, the applicant has demonstrated to the County Council's Director of Public Health a willingness to support monitoring arrangements if planning permission is granted.

- 5. The Director of Public Health should be informed of the results of the measurements and any breaches to the planning condition or environmental permit.*

The Director of Public Health will be informed of the results of the measurements and any breaches to the planning conditions if planning permission is granted. The Environment Agency, Health and Safety Executive and Department of Energy and Climate Change will be invited to do similar if permission is granted.

- 6. Consider the need to seek further clarification from the Applicant that the cumulative impacts of the operations from the flare, generators, vehicles and drilling will not exceed the national air quality objective thresholds, particularly for PM 24 hour mean levels.*

Further clarification was sought from the applicant through a Regulation 22 information request as follows:

PM10 from generators and vehicles:

An assessment of PM10 (particulate matter of 10 microns diameter or less) from generators and vehicles has been undertaken and presented for both the Preston New Road and the Roseacre Wood proposed exploration sites as part of a further information request. Detailed dispersion modelling has been used to assess the impacts from the generators and the vehicle movements to/from the site. A number of worst case assumptions have been made in the modelling to ensure a conservative approach has been taken. The modelling shows that no significant effects are likely to result.

In order to calculate the total cumulative impacts from generators and traffic the scheme related concentrations are added together. The findings from this cumulative assessment of PM10 for the Roseacre Wood and Preston New Road site during operations are that the results indicate no receptor is likely to experience a change of greater than, or equal to 1% of the annual mean objective (40µg/m³). As such no significant effects are likely to result from cumulative impacts. The total concentrations are also well below the air quality objectives for PM10

PM10 from Flaring

The generation of PM10 emissions from the flare has been scoped-out of the assessment due to the gas composition and high efficiency of combustion. This has been agreed with the Environment Agency and is described in the permit:

"Particulates have been covered by a qualitative assessment as we would not expect PM10 to result from gaseous emissions. It formed part of the air quality assessment submitted by the applicant and is included in the habitats section for completeness".

Indeed the Agency has further clarified its position in relation to particulates from flaring of natural gas in that when there is full and efficient combustion (based on temperature and retention time) the emissions are not likely to contain particulate matter.

An enclosed flare, which is a requirement for these activities, allows more control of the process, and the temperature can be continuously monitored along with the retention time to ensure the combustion process is complete. The gas flow to the flare and the gas composition are also measured.

In this case the applicant will produce an Environmental Management and Monitoring Plan before they are operational which will need to be approved by the EA; this plan will contain details of appropriate control measures they will put in place should efficient combustion not be achieved.

PM10 from Drilling

No PM10 emissions from drilling would be expected as the material drilled would be wet. Also any dust-creating processes on site would be mitigated by following the site Environmental Operating Standard (see ES:4.13.1 & Appendix E).

- 7. As part of either the planning or permitting process, the Applicant should be required to submit regular data on the ambient air quality on site measuring all the common air pollutants relevant to the activity and report them regularly. PM10 and PM2.5 should be reported separately.*

The EA permit requires, through the Waste Management Plan, monitoring of 13 ambient air quality parameters including PM2.5 and PM10. This will be done prior to operations commencing to establish a baseline, during operations and after operations have ceased. Four sampling positions will remain constant at the perimeter of the site. The parameters are: methane, carbon monoxide, hydrogen sulphide, nitrogen dioxide, nitrogen monoxide, sulphur dioxide, ozone, total petroleum hydrocarbons, VOCs, BTEX, PM2.5 and PM10, dust. Results will be published monthly and submitted to the Agency for check and verification.

Monitoring of particulates will be undertaken throughout the operational period of the site using Frisbee-type dust gauges with directional adhesive strips (for nuisance dust) plus pumped gravimetric sampling for PM10 and PM2.5 will be located at four locations in close proximity to key receptors.. The sampling period for gravimetric monitoring for PM10 and PM2.5 will be 24 hours.

In addition the EA requires point source emission monitoring from the flare for oxides of nitrogen, carbon monoxide, total volatile organic compounds, and methane (using emission modelling calculations)

- 8. The Roseacre Wood site is within 55m of a National Grid gas transmission pipeline. Interconnections into national transmission pipelines are proposed at both sites. Advice should be sought and an assessment undertaken as to whether the nearby gas transmission pipelines are considered to be a major hazard.*

Advice has been sought from the Health and Safety Executive and National Grid, and there is not a major hazard. Both agencies are satisfied that the risks can be managed effectively.

9. Any extended flow testing provided for by any planning permissions should be aligned with the permits to be issued by the Environment Agency.

This planning application includes extended flow testing and the Environment Agency has confirmed the permit does similar.

10. An assessment of light pollution as part of the site operations should be carried out, and if there are likely to be significant impacts associated with light pollution from the sites that cannot be mitigated or controlled, the Applicant should be requested to consider the opportunity to offer to fit blackout blinds to those homes most likely to be affected

An assessment of light pollution has been undertaken as part of the determination.

The project will involve 24 hour operations during drilling and hydraulic fracturing. Lighting of working areas will also be necessary during winter when standard working hours overlap with the hours of darkness. Low-level security lighting will also be required so that the site operatives and security staff can carry out their monitoring activities during night time hours.

Lighting has properly been assessed; it is concluded there would be some light pollution at night. Notwithstanding it would be for an extended period of time, with the mitigation measures proposed, and which could be controlled by condition, on balance, it is considered that lighting could be made acceptable and that the impacts associated with such would not be so great to affect amenity on a permanent basis or lead to unacceptable effects on nature conservation to constitute a sustainable reason for refusal.

Subject to the mitigation measures proposed, and which could be controlled by condition, it is considered on balance that the proposed lighting for a temporary period would be acceptable for the purposes of the NPPF Policy DM2 of the LMWLP and Policy EP28 of the Fylde Local Plan.

11 Further clarification or new information on the occurrence and magnitude of equipment likely to be contaminated with radioactive waste and how such waste would be managed on the site and disposed of should be sought.

It is important to stress that the levels of radiation associated with contaminated waste are very low and come from Naturally Occurring Radioactive Materials (NORM). Nevertheless, NORM is regulated through the Radioactive Substances Regulations.

The applicant has provided further information following an information request. Section 5.2 of the Waste Management Arrangement of the Radioactive Substances Regulations (RSR) permit applications to the Environment Agency state the build-up of insoluble carbonate and/or sulphate scales inside pipes is a possibility due to a

change in pressure or temperature as the water is brought to the surface. It is highly unlikely however, due to the short term nature of the operations that any significant scale will build up inside the pipes. In the unlikely event that significant scaling of components occurs (and is identified via the proposed contamination monitoring regime), it shall be ensured that the pipework/component is capped/sealed to prevent release of material, and the Agency will be contacted for advice.

Similarly, physico-chemical changes within the accumulating waters may lead to the formation of small volumes of precipitate, which could contain elevated concentrations of radionuclides. The potential for such waste will be addressed by the contamination monitoring regime.

The Best Available Technique (BAT) statement section 3.2 of the RSR permit application to the Environment Agency states: *“given the potential for the scaling-up of pipework (with insoluble radium carbonate and sulphate scales), and/or the contamination of phase separator equipment/material, allowance has also been made for the generation of a relatively small quantity of solid radioactive waste. Accumulation and disposal of a nominal 40 MBq each of Ra-226 and Pb-210, and 16 MBq each of Ra228 and Th-228 has been requested within the Permit application.”*

Section 7.1 goes on to state: *“As soon as practicable, after identification and characterisation, low-level solid waste would be transferred to a suitable EPR10-permitted treatment or disposal facility.”*

Section 7.2 (contamination monitoring) states: *“A number of baseline samples will be taken prior to commencement of works on the sites, to determine background concentrations of radionuclides in the local area. A background contamination survey will also be performed (using a suitable alpha/beta contamination monitor). A contamination monitoring programme will be devised, to ensure that any significant (albeit improbable) environmental contamination is promptly identified. This will include alpha/beta contamination monitoring of key areas/surfaces, including:*

- *Well-head (and immediately surrounding site surface).*
- *Separator equipment [external surfaces, and any internal surfaces opened for maintenance/access (and the immediately surrounding site surface).*
- *Storage tanks (internal surfaces where practicable, external valves and immediately surrounding site surface).*

Consignments of flowback fluid will also be screened externally for contamination, prior to leaving site. At close of works, all potentially-contaminated equipment will be screened prior to leaving site. The frequency, actions and responsibilities associated with monitoring shall be documented in the site Environmental Management and Monitoring Plan (EMMP)”.

Section 7.3 goes on to state: *“Solid waste would be stored within a secure container, or within a secure lay-down area, as appropriate. Where appropriate, pipework/components would be capped to prevent release of contamination.*

In addition flowback tanks will be monitored on arrival at site to establish a baseline radiation contamination level. Prior to leaving site further radiation contamination

monitoring will identify any elevated levels of radiation. In the unlikely event an elevated level is identified above baseline levels the tanks will be cleaned to remove any precipitate and subsequently disposed at an offsite waste treatment facility."

12. *Should planning permission be granted, it should be a pre requisite that no activity can start until the onsite and offsite waste treatment capacity is defined*

The Environment Agency permit (through the Waste Management Plan which it incorporates) sets out controls for the management of waste onsite and offsite.

Onsite, the permit controls the storage arrangements for different the waste types. The maximum volume of storage and storage structure are prescribed. For example, a maximum of 3,000m³ is given for flowback fluid at any one time, and this must be regularly removed to an offsite permitted waste facility. Flowback fluid must be stored in steel solid tanks (approx. 6mm thickness with annual non-destructive testing inspection)

The Agency has assessed the application and is satisfied that the waste can be safely dealt with. If an appropriate permitted outlet for the waste cannot be found, the Agency permit requires that operations will have to stop.

As explained in the assessment of recommendation 4, in light of case law as well as national guidance (NPPF paragraph 122) it is not appropriate to impose planning conditions with respect to matters that are within the remit of other regulatory regimes. The mineral planning authority should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. The County Council should assume that these regimes (in this case the regulation of waste disposal) will operate effectively.

In terms of onsite waste management spill containment protocols, assessment of the containment capacity of the well pad is presented in the ES. Appendix B to the ES identifies that a total volume of 1170m³ will be provided to contain spilt fluids. This volume is provided by use of the perimeter ditches, voids within the stone matrix and min 50mm air freeboard. Section K2.4 of Appendix K to the ES refers to Environment Agency guidance, in particular EA PPG26 'Drums and intermediate bulk containers', on the recommended storage capacity to contain spills and leaks of potentially polluting liquids. Where more than one tank is situated in a single bund the bond volume should be at least 25% of the aggregate tank contents. Section K2.4 of the ES details the aggregate tank contents as 3176m³ and identifies that 25% of this volume (795m³) is significantly less than proposed containment volume provided at the site. It is concluded that there is adequate capacity to contain spills assessed in accordance with EA guidance.

Section 4.5.4 of the ES describes the proposed construction of the well pad. Migration of any spilt fluid to underlying soils and ground waters will be prevented by the 1mm thick fully welded HDPE [plastic] membrane - such membranes are commonly used to construct water retaining structures such as swimming pools. Joints in the membrane are fully tested for water tightness and certified as part of the construction process. The membrane is protected against puncturing by the geotextile materials

placed above and below the membrane. Further protection against puncturing is also provided by the geogrid placed below the granular sub-base layer (see Appendix B of the ES).

13. *Further clarification should be sought that any specific risks due to using the MoD site for accessing the Roseacre Wood site have been addressed before any planning permission is granted.*

The MOD maintains no safeguarding objections to the application but requested some further assessments are undertaken. The MOD does not object to the applicant's proposal to utilise this route across MOD property and will establish relevant terms of access directly with the applicant to facilitate this.

14. *A full assessment of the impacts of additional traffic associated with the proposals on road safety should be carried out and appropriate traffic management options considered to address the public concerns, particularly in respect of the Roseacre Wood site.*

A full assessment of traffic impacts associated with the proposed development has been carried out by the applicant as part of the ES and the further information that has been submitted more recently. An assessment of the impacts has been carried out against the policies of the NPPF, the development plan policies and in light of advice received from the Highways Agency, LCC Developer Support (Highways) and with regard to those views received in representations. The assessment is in Appendix 17.

- 15 *Should planning permission be granted, provision should be made with the Applicant to maintain road safety, particularly on the access routes to Roseacre Wood site and road safety and any related incidents on the access to both the sites should be monitored.*

The recommendation is that planning permission should not be granted because of highway and road safety impacts.

16. *In the event planning permissions are granted, any breach of planning conditions should be reported to the Director of Public Health so that necessary steps can be taken in protecting and improving the health of local communities from issues arising due to the alleged or identified breaches of planning control*

Should planning permission be granted, any breaches of control will be reported to the Director of Public Health.

Health studies referred to in representations.

Many representations received by the County Council refer to research conducted in North America and overseas that indicate shale gas extraction is linked to adverse health impacts. A large number of studies are referenced. Some of the research referred to examines a wide range of other studies to draw conclusions about health impacts.

While much research exists, and is growing in volume each year, it is difficult to gain an objective view of the veracity of the research. Anti-fracking campaigners frequently point to studies that indicate increased health risks (e.g. elevated risks of cancer or birth defects) as a result of shale gas activity in North America. Conversely, pro-fracking campaigners point to numerous methodological flaws in the research. It is also difficult to translate the findings of research from North America into the UK environment. Operating and regulatory practices are very different.

In June 2014, Public Health England (PHE) published a review into the potential health impacts of shale gas extraction. The review drew on significant scientific evidence in peer reviewed or published reports up to January 2014. Much of the research cited in representations to the County Council was reviewed by PHE.

PHE say there have been very few epidemiological studies or health risk assessments published in the peer reviewed literature. Epidemiology is the branch of medical science that investigates all the factors that determine the presence or absence of diseases and disorders. It aims to assess the cause of a disease, and seeks to look beyond associations which might be a result of chance, bias or confounding effects.

Two of the most frequently cited studies in representations relate to work by a research group in the School of Public Health at the University of Colorado. The studies look at possible associations between health status and exposure to air pollutants from shale gas activities.

McKenzie et al (2012) used a risk assessment methodology which considers cancer and non-cancer endpoints separately to assess the potential health impact of air emissions from shale gas extraction and related activities. PHE say it should be noted that the risk assessment methodology used in this study is not recommended for use in the UK.

McKenzie et al (2014) examined a possible link between air pollution and adverse birth outcomes, including congenital malformations.

Both papers are considered in some detail by PHE.

In McKenzie et al (2012) the key finding was that the estimated risks for cancer were elevated for those residents living within half a mile of the gas wells during well completion.

PHE say the research has a number of limitations and uncertainties, many of which are acknowledged by the authors. These include:

- Small sample size and the limited amount of data on emissions around well completion sites.
- Further work is needed to profile emissions during the stages of gas well development.
- Non-methane pollutant emissions appear to vary substantially by field type, number of well heads, completion process and types of controls in place. This makes application of the results to other shale gas extraction sites difficult.

- A limited number of volatile organic compounds was explored. Other pollutants such as aldehydes, diesel exhaust, ozone and particulate matter, were not considered.
- The existing background level of pollution needs further assessment to enable pollution caused by shale gas extraction and related activities to be reliably assessed.
- The impact of local meteorology and topography means that the results are not easily applicable to other areas and other extraction sites.

Also, PHE point out the approach used for cancer risk assessment in the US is not recommended for use in the UK by the UK advisory Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) if the risk values used are derived from animal data.

The same research group has examined a possible link between maternal exposure to air pollutants associated with shale gas extraction activities and birth outcomes such as congenital heart defects, neural tube defects and low birth weight (McKenzie et al, 2014). Public Health England has similarly reviewed this study.

McKenzie et al (2014) reported a positive association between exposure and prevalence of congenital heart defects. The association with neural tube defects was considerably weaker.

PHE's review concludes that the reported risks have wide confidence intervals which weaken the reported association and chance findings cannot be excluded, given the number of analyses carried out. The exposure assessments relied upon an indirect approach rather than direct measurements of exposure. Furthermore, the study was unable to differentiate between the phases of well development, which could be important in terms of the type of and amount of pollutants emitted.

Maternal education, age, smoking status and alcohol consumption were considered as potential confounding factors, but it is not clear that confounding was adequately addressed for socioeconomic status or previous experience of birth defects.

Overall, the study suggests a possible link between maternal exposure to air pollutants which may arise from shale gas extraction activities and a range of birth defects, particularly congenital heart defects, although the authors acknowledge that further research is needed to examine whether a link with shale gas drilling was causal.

PHE state the obvious limitations in terms of exposure assessment highlight the need for such health studies to have access to robust assessments of exposure both before and after development of a site for gas exploration and extraction.

Further criticism of the McKenzie et al (2014) research came from the Chief Medical Officer and Executive Director of the Colorado Department of Public Health and Environment in the USA. In a statement from the Department, the Chief Medical Officer said:

“...we disagree with many of the specific associations with the occurrence of birth defects noted within the study. Therefore, a reader of the study could easily be misled to become overly concerned.”

Among a range of limitations, the statement points out:

- *“The study showed decreased risk of pre-term birth with greater exposure. This seems counterintuitive, and again, makes the study difficult to interpret. (The study data showed that the nearer the mother lived to a well, the less likely the mother was to give birth prematurely or to have a low-birth-weight baby.)”*
- *“As the authors noted, they don’t necessarily know where the mother lived at the time of conception or during the first trimester of pregnancy, when most birth defects occur. This makes interpretation of their study difficult.”*

Another study cited in representations is the research by Kassotis et al (2013). The study, reported in the national media at the time, indicated that chemicals used in fracking could cause infertility, cancer and birth defects.

PHE reviewed the study. The researchers detected endocrine disrupting activity (oestrogenic, anti-oestrogenic or anti-androgenic activity) in laboratory tests for a selection of 12 chemicals used in natural gas extraction in the US. Endocrine disruptors are chemicals that, at certain doses, can interfere with the endocrine (or hormone) system in mammals. These disruptions can cause cancerous tumors, birth defects, and other developmental disorders.

Endocrine disrupting activity was also detected in groundwater and surface water considered to have been contaminated by fluids/wastewater from natural gas extraction processes (i.e. from spills/leaks), again using a laboratory test system.

PHE report that the authors suggested that the reported endocrine disrupting activity of the chemicals used in natural gas extraction may have contributed to the endocrine disrupting chemical activity detected in the water samples, i.e. in areas where contamination spills of fluids/wastewater used in gas extraction may have occurred. PHE say this is a single study showing a relatively weak response in laboratory tests.

The County Analyst has also reviewed this research and highlighted limitations in the study which include a lack of direct identification of shale gas chemicals in the water that was tested. In other words, the chemicals found in water samples could have come from many sources, including agriculture, industry or from natural sources.

Many objectors refer to the 2015 report of the public health charity Medact. Medact say the risks and serious nature of the hazards associated with fracking, coupled with the concerns and uncertainties about the regulatory system, indicate that shale gas development should be halted until a more detailed health and environmental impact assessment is undertaken.

The Medact report has not produced new epidemiological research but has reviewed published literature and has requested short papers from relevant experts in particular subject areas. It has also interviewed academics and experts.

Unfortunately, one of the contributors (contributing to three of the report's six chapters – chapters 2, 4 and 5) has led a high profile campaign in the Fylde related to shale gas. Another contributor to the report (chapter 3) has previously expressed firm views on shale gas and has objected to this application. This has led to questions from some quarters about the report's objectivity.

In light of these uncertainties it is not clear how much weight the County Council should attach to the report.

PHE has reviewed other research on health and shale gas, and its report can be found here:

<https://www.gov.uk/government/publications/shale-gas-extraction-review-of-the-potential-public-health-impacts-of-exposures-to-chemical-and-radioactive-pollutants>

In summary, as well as highlighting the limitations of the studies, PHE state that direct application of the North American research to the UK situation is impossible because of the wide differences between the two countries. It is clear from experience in the US that emissions vary widely depending on the phase of development, operational practices, the geology, local topography and meteorology, and the types of activities and equipment on-site.

PHE state that such variability makes direct application to the UK situation impossible, but shows that control of emissions from shale gas extraction and related activities will be of central importance. PHE say that comprehensive air monitoring and associated assessments of health risks will be required in the UK to inform regulation of each phase of the operation. Such assessments should also consider the cumulative impact of multiple wells. It will be important to ensure that environmental monitoring is undertaken in advance of, as well as during, operations.

At present there is limited environmental and health surveillance data within the published literature in relation to existing shale gas extraction operations. There have been very few epidemiological studies (as opposed to statistical associations) and those that have been carried out generally lack robust exposure assessments according to PHE.

There are also fundamental differences between North America and the United Kingdom in relation to the potential risks from shale gas, according to the Royal Society/Royal Academy of Engineering report 'Shale Gas Extraction in the UK':

- The operating practices of shale gas companies in the USA are different from those in the UK (Para 3.1.4).
- The UK's regulatory approach is commended (Para 6.1)

Conclusion

The County Council's Director of Public Health has provided specific advice to inform the planning process and provide public health advice to protect and improve the health of local residents living near the proposed shale gas exploration sites of Preston New Road (planning application numbers LCC/2014/0096 and 0097) and Roseacre

Wood (planning application numbers LCC/2014/0101 and 0102). The advice was published as a Health Impact Assessment (HIA) in November 2014.

The Health Impact Assessment makes 45 recommendations to a broad range of agencies, suggesting actions before, during and after any permissions or permits are granted. Appendix J contains 16 recommendations to specifically inform the determination of this application (together with the Roseacre Wood applications).

Given the advice is specific to this application, an assessment has been undertaken in relation to each of the 16 recommendations in Appendix J of the HIA.

Recommendation 4 states: 'Seek agreement with the Applicant to establish an independent comprehensive baseline and on-going long term monitoring of environmental and health conditions prior to any activity on the sites'.

The applicant has shown a willingness to enter into discussions with the County Council's Director of Public Health to support an independent, long term monitoring programme in the event that planning permission is granted.

Recommendation 15 states: 'Should planning permission be granted, provision should be made with the Applicant to maintain road safety, particularly on the access routes to Roseacre Wood site and road safety and any related incidents on the access to both the sites should be monitored.

The recommendation is that planning permission should not be granted because of highway and road safety impacts.

Many representations received by the County Council refer to research conducted in North America and overseas that indicate shale gas extraction is linked to adverse health impacts.

While much research exists, and is growing in volume each year, it is difficult to gain an objective view of the veracity of the research. Anti-fracking campaigners frequently point to studies that indicate increased health risks (e.g. elevated risks of cancer or birth defects) as a result of shale gas activity in North America. Conversely, pro-fracking campaigners point to numerous methodological flaws in the research. It is also difficult to translate the findings of research from North America into the UK environment. Operating and regulatory practices are very different.

In June 2014, Public Health England (PHE) published a review into the potential health impacts of shale gas extraction. The review drew on significant scientific evidence in peer reviewed or published reports up to January 2014. Much of the research cited by objectors in representations to the County Council was reviewed by PHE.

PHE say there have been very few epidemiological studies or health risk assessments published in the peer reviewed literature. Epidemiology is the branch of medical science that investigates all the factors that determine the presence or absence of diseases and disorders. It aims to assess the cause of a disease, and seeks to look beyond statistical associations which might be a result of chance, bias or confounding effects.

PHE highlight significant methodological flaws in the research that has been cited to the County Council.

Moreover, one study frequently cited by objectors (McKenzie, 2014) has been publically criticised by the Chief Medical Officer and Executive Director of the Colorado Department of Public Health and Environment in the USA as follows: "*we disagree with many of the specific associations with the occurrence of birth defects noted within the study. Therefore, a reader of the study could easily be misled to become overly concerned.*"

PHE state that direct application of the North American research to the UK situation is impossible because of the wide differences between the two countries. It is clear from experience in the US that emissions vary widely depending on the phase of development, operational practices, the geology, local topography and meteorology, and the types of activities and equipment on-site. PHE state that such variability makes direct application to the UK situation impossible. There are also different regulatory practices in the UK.

At present there is limited environmental and health surveillance data within the published literature in relation to existing shale gas extraction operations. There have been very few epidemiological studies (as opposed to statistical associations) and those that have been carried out generally lack robust exposure assessments according to PHE.

Nevertheless, from the modelling, audit checks and sensitivity analysis conducted by the EA it is expected there will be no exceedance of standards that protect public health. Public Health England is satisfied the currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with such extraction are low if the operations are properly run and regulated. Noise and air quality assessments undertaken by the County Council and its specialist consultants indicate that potential risks to public health are low if the operations are properly run and regulated.