THE INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009

Preesall Underground Gas Storage Facility, Lancashire

Health Impact Assessment Appendices

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Abbreviations and acronyms

COMAH...................................... Control of Major Hazards and Emergencies
CLP ................................................................. Community Liaison Panel
EIA ................................................................. Environmental Impact Assessment
HIA ................................................................. Health Impact Assessment
HPA ................................................................. Health Protection Agency
LFL .................................................................... Lower Flammable Limit
PCT ..................................................................... Primary Care Trust
UGS ..................................................................... Underground Gas Storage
A Screening

A.1. Halite requested screening opinions from statutory consultees and the IPC as part of the initial preparation for their planning application.

A.2. Extracts from the response are provided in Table A.1. Collectively these responses provide the screening justification for undertaking the HIA.

A.3. Some responses such as North Lancashire PCT specifically request a standalone HIA, other statutory consultees request health information in the context of the Environmental Impact Assessment.

A.4. The responses in Table A.1 have also informed the HIA scoping exercise.

Table A.1: Statutory consultee screening opinion extracts

<table>
<thead>
<tr>
<th>IPC / Consultee</th>
<th>Scoping Response</th>
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<tbody>
<tr>
<td>NHS North Lancashire</td>
<td>The PCT requests that a comprehensive health impact assessment is commissioned to assist in decision-making, and developing interventions that mitigate against any risks identified.</td>
</tr>
<tr>
<td>NHS North West</td>
<td>It is important that the EIA identifies and assesses the potential public health and socio-environmental impacts of the proposed development in its development, operational and decommissioning phases.</td>
</tr>
<tr>
<td>IPC</td>
<td>The Applicant should have particular regard to the responses received from the relevant statutory consultees regarding health.</td>
</tr>
<tr>
<td>IPC</td>
<td>The methodology for the HIA, if prepared, should be agreed with the relevant statutory consultees and take into account mitigation measures for acute risks.</td>
</tr>
<tr>
<td>Health Protection Agency</td>
<td>It is important that the EIA identifies and assesses the potential public health impacts of the activities at, and emissions from, the installation. Assessment should consider the development, operational and decommissioning phases.</td>
</tr>
<tr>
<td>Health Protection Agency</td>
<td>The applicant should ensure that the EIA contains sufficient information for relevant authorities to be able to fully assess the potential impact of the development on public health.</td>
</tr>
<tr>
<td>IPC / Consultee</td>
<td>Scoping Response</td>
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<tr>
<td>Health Protection Agency</td>
<td>Recommend that a separate section be included in the environmental statement summarising the impact of the proposed development on public health: summarising risk assessments, proposed mitigation measures, and residual impacts. This section should include any information relating to health contained in other sections of the application (for example air quality, emissions to water, etc).</td>
</tr>
<tr>
<td>Health Protection Agency</td>
<td>Comments should be sought from the Food Standards Agency for matters relating to the impact on human health of pollutants deposited on land used for growing food/crops.</td>
</tr>
<tr>
<td>NHS North West</td>
<td>The applicant should ensure that the EIA contains sufficient information for relevant authorities to be able to fully assess the potential impact of the development on public health. A full health impact assessment should be included in the environmental statement summarising the impact of the proposed development on public health; summarising risk assessments, proposed mitigation measures, and residual impacts.</td>
</tr>
<tr>
<td>NHS North West</td>
<td>The health impact assessment should include any information relating to health contained in other sections of the application (for example air quality, emissions to water etc) and incorporate a full risk assessment and incident planning statement to include information about how the applicant would respond to accidents with potential off-site emissions for example flooding, fire, spills and leaks.</td>
</tr>
<tr>
<td>NHS North West</td>
<td>The EIA should consider; the implications and wider environmental and public health impacts of waste disposal options, disposal route(s) and transport method(s) and how potential impacts on public health will be mitigated.</td>
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B Review of Preesall UGS Quantitative Risk Assessment

Introduction

B.1. Previous applications for underground gas storage (UGS) caverns at Preesall have been submitted by Canatxx Gas Storage Limited (Canatxx). In preparing this application Halite Energy Group Limited (Halite) has taken steps to address the concerns generated by the Canatxx application. This has included reducing the size of the project and restricting the application to the more geologically stable part of the Preesall site. Halite has also commissioned additional studies, to address knowledge gaps in previous applications. These include:

- the Quantitative Risk Assessment (QRA) which considers potential failures of the storage caverns and the pipelines (1). The QRA examines the level of risk from potential hazards and the mitigation measures which are expected to be in place; and
- this Health Impact Assessment (HIA), which examines the potential affects on health, well-being and health inequalities, which may result from the proposed application.

B.2. Halite has consulted the public and statutory stakeholders on the proposed UGS. Halite has also adopted a policy of openness and transparency.

B.3. The QRA is the main way in which Halite seeks to evaluate the risk, or likelihood, of a failure in the UGS or the pipelines and thus to address, and respond to, the public’s concerns. This section of the HIA reviews the ways in which the QRA addresses the potential hazards associated with the proposal. Where relevant the review also considers information from the public consultation and the Environmental Impact Assessment.

Review context

B.4. The QRA (1) uses Health and Safety Executive (HSE) parameters to calculate the ‘acceptable’ levels of risk of an accident occurring within particular vicinity over a given time frame (2).

B.5. The QRA seeks to identify, to minimise and thus to remove adverse effects on the local population. Where potential hazards have been identified by the QRA, Halite has either designed engineering solutions to minimise risk, or developed management systems, which will be in place during operation to keep hazards under control. In this manner Halite intends to operate in compliance with the regulations enforced by the various authorities, be that Health and Safety Executive (HSE), Environment Agency (EA), or Local Authority (LA). This is a common stance for a reputable operator.
B.6. It should be noted that despite the identification and mitigation of the main risks and potentially adverse effects of the UGS proposal, this will not dispel all fears associated with the proposed project. The QRA does not claim that the project is risk-free (1: para E25):

“... All human activities have associated risks. The risk assessment for this has shown that only in the very worst case accidents could members of the public possibly be at risk. The probability of such accidents is extremely low and less than posed by everyday activities that are generally accepted as ‘safe’. The detailed design and assessment under the COMAH [Control of Major Accident Hazards] regulations will investigate measures to further reduce these risks.”

B.7. This issue is also stated clearly, although with a different conclusion, in the public consultation:

“... No project is 100% safe therefore it is obvious that it shouldn’t be sited in the middle of an area, which is densely populated. Our opinions should be listened to. It's much too close to all the Wyre area residents-under our feet” Respondent at Stalmine exhibition.

B.8. If the proposal is passed by the Infrastructure Planning Commission, Halite will undertake detailed emergency planning. Many of the consultation comments seek certainty about the emergency response in the event of a catastrophic incident. This issue has also been minuted at the meetings of the Community Liaison Panel (3).

B.9. It is not possible to begin detailed emergency planning at this stage however the HIA Team recommended that additional information is given about this process; for example, the organizations which will be involved (statutory and local,) and the types of activities that will take place.

B.10. In response, Halite state that they have consulted Fire and Rescue and the Lancashire Resilience Forum and as a result of that an emergency access road has been added to the site. Emergency planning will commence if and when the project is approved.

B.11. Halite state that emergency planning is likely to involve all, or some, of the following:

- regular site visits by all the emergency services to familiarise them with the site layout, equipment, chemicals, processes, emergency shutdown systems and access etc;
- training, if necessary, for processes/chemicals they have not been involved with before for example methanol;
- possible purchase of equipment to allow them to carry out their role;
- desk-top and on-site exercises and simulations; and
- agree standard call out equipment for emergency call.

B.12. Halite also state that should they be successful in gaining permission for the proposals they would develop pre-construction and pre-operation safety reports in line with Control of Major Accident Hazards (COMAH)
regulations. Information regarding safety and emergency plans would be made publicly available.

B.13. This review of the QRA considers some of the hazards associated with the development in more detail below. However as it is important to understand the QRA in context the review will first examine the public consultation and the public understanding of risk.

Public consultation
B.14. In their Feedback Report Halite describe their consultation activities and the ways in which they have adapted the proposed project (4). The summary below focuses on the written consultation responses, which were submitted to Halite. These were submitted at the public consultation and presentations at Fleetwood, Thornton, Stalmine and Knott End. The summary also includes written responses submitted to Halite via email and post.¹

B.15. In total there were ninety nine written responses. The HIA Team found that eighty four were against the proposed development and four were in favour of the proposed development. Eleven responses were non-committal. Of these ninety nine responses, twenty one people expressed a clear opinion that they were not happy with the process while twenty four stated they were happy with the process. It is clear that at least twenty people were not in favour of the proposals but recognise the value of the planning process and the provision of information.

B.16. The issues which were raised by the respondents cover beneficial and adverse effects.

B.17. From the responses the HIA team identified the following issues which were considered, by the respondents, to be contentious:

- overriding the wishes of population;
- reincarnation of previous project (Canatxx);
- question the need for the UGS;
- traffic & transport;
- effects on the marine environment;
- absence of emergency plans;
- uncertainty about safety;
- uncertainty about movement of gas;
- uncertainty about geological information;
- devaluation of property;
- increase of insurance premiums;
- proximity of residential properties;
- degradation of local environment; and
- decommissioning.

¹ The consultation process is described in detail in Halite’s Feedback report (4: p7-8). This is an overview document and it is not a statutory document. The consultation report will be a formal statutory document.
B.18. Fear and uncertainty were a recurring theme in the consultation and formed the basis for many of the objections to the proposal. Such fear and uncertainty can be considered a direct health effect of the UGS proposal: fear of an environmental hazard, itself, may give rise to anxiety attacks and these may manifest as headaches, hypertension, and other low grade illnesses (5).

B.19. A review by the HIA team identified the following beneficial issues from the responses:

- provision of jobs;
- opportunity to improve amenity value (for example providing path for walkers and wheelchair users in the area).

B.20. These issues have been considered through the HIA and in the other assessments being conducted for the proposed development.

Public understanding

B.21. The consultation suggests that awareness of the issues associated with the UGS among the local population has become heightened by:

- previous planning applications on the same site (albeit under a different company);
- the ongoing disturbance in the locality generated by the shale gas exploration (6), and
- the longer term memory of the explosion at Abbeystead Water Treatment Works (7;8).

B.22. In addition there were earth tremors, in April and May 2011. The epicentre of the May event was within 500 metres of Preese Hall (9) which is approximately 5 miles from Preesall. Reports in the national and local press linked these events with the fracking operations (fracturing and drilling with high pressure liquid) which are taking place on the Fylde in general, and in Preese Hall in particular (10-12).

B.23. The way in which risk is calculated and expressed, and the public’s understanding of risk, are often at odds with each other. Figure B.1 lists issues that can exacerbate concerns amongst the public: issues i-x have been raised in the public consultation for the current proposal. They were also raised with regard to the previous application (13). As noted above, these ‘fear factors’ can also be considered a direct health effect of the current proposal. All of these can be exacerbated by uncertainty associated with the hazard.

**Figure B.1: Risk and public understanding**

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<th>viii</th>
<th>ix</th>
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<tr>
<td>provision of jobs</td>
<td>opportunity to improve amenity value (for example providing path for walkers and wheelchair users in the area)</td>
<td>previous planning applications on the same site (albeit under a different company)</td>
<td>the ongoing disturbance in the locality generated by the shale gas exploration</td>
<td>the longer term memory of the explosion at Abbeystead Water Treatment Works</td>
<td>In addition there were earth tremors, in April and May 2011.</td>
<td>Reports in the national and local press linked these events with the fracking operations (fracturing and drilling with high pressure liquid) which are taking place on the Fylde in general, and in Preese Hall in particular</td>
<td>The way in which risk is calculated and expressed, and the public’s understanding of risk, are often at odds with each other.</td>
<td>Figure B.1 lists issues that can exacerbate concerns amongst the public: issues i-x have been raised in the public consultation for the current proposal. They were also raised with regard to the previous application</td>
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</table>

The list below gives ‘fright factors’ associated with an intervention or a scenario. They are numbered for ease of reference and do not imply any order of importance. Risks are generally more worrying (and less acceptable) if perceived:
i. to be involuntary (for example exposure to pollution) rather than voluntary (for example dangerous sports or smoking);

ii. as inequitably distributed (some benefit while others suffer the consequences);

iii. as inescapable by taking personal precautions;

iv. to arise from an unfamiliar or novel source;

v. to result from man-made, rather than natural sources;

vi. to cause hidden and irreversible damage, for example through onset of illness many years after exposure;

vii. to pose some particular danger to small children or pregnant women or more generally to future generations;

viii. to threaten a form of death (or illness/injury) arousing particular dread;

ix. to damage identifiable rather than anonymous victims;

x. to be poorly understood by science; and

xi. as subject to contradictory statements from responsible sources (or, even worse, from the same source).

From Department of Health (14: p5)

Review of the QRA

B.24. Having established the context in which the QRA is being received, the following review examines particular issues relevant to the HIA and makes observations and recommendations.

Catastrophic failure

B.25. The QRA seeks to address all scenarios: risk is expressed as the likelihood of an incident occurring in a given timeframe (for example 1 in a 100 million per year). The risks are addressed by engineering and management solutions.

- The QRA identifies areas as being at risk, for example the area adjacent to the Gas Compressor Compound, especially Cote Walls Farm. However, the QRA notes that the total risk to an individual at Cote Walls Farm is $3.1 \times 10^{-8}$ per year (1: para 4.10.5.1.6).

- There are assessments for members of the public on Wyre Way and on the golf course. The risk levels for injury due to jet fire, explosion, or gas release are calculated as less than one in a 100 million (per year). We note that the assessment assumes that the Wyre Way is unused for much of the time, thus the likelihood of anyone being present in the case of an accident occurring is considered to be very small, though this would not alter the consequences – it is likely that anyone present would be severely injured or killed. The likelihood of an explosion occurring is independent of the likelihood of someone being on the Wyre Way.

B.26. The QRA concludes that the envisaged scenarios are highly unlikely. The method used for these calculations is standard and acceptable. However, scientific analysis is not always the main factor in public
understanding of risk: public reaction to an environmental hazard can relate more to the feared consequences of exposure, rather than the likelihood of exposure (5).

B.27. The expression of risk is complex. Halite’s website provides a less technical summary of the steps taken to minimise risk (16). Responses to Halite’s public consultation note that the project cannot be 100% safe.

B.28. This review finds the calculations to be appropriate. However, such quantifications of risk are unlikely to wholly allay fear and uncertainty associated with the proposal. Due to such perceptions of risk, continuing low-level adverse health effects can be expected.

**Aircraft strike**

B.29. The QRA for aircraft impact (p110, Appendix A of QRA) is based on the method presented in the latest HSE failure rate and event data for use within Land Use Planning (LUP) risk assessments (2). The QRA considers failure due to impact from an aircraft to be highly unlikely. This is outside Halite’s control.

B.30. The QRA states that the wells can be turned off in the event of a crash, with both surface and deep subsurface valves. Halite state that the valves will be remotely operated from the control room situated at the booster pump house and probably from the buildings at Higher Lickow where there may be a monitoring station containing all the relevant information from the site (not a second control room just monitoring). This will be further developed during detailed design. The facility will be built and operated under COMAH and therefore strictly monitored by the HSE.

B.31. The HIA notes that further development of emergency planning is required to address the potential of the entire surface of the site becoming disabled by external factors, such as an aircraft strike. This would mean that surface valves and all controls would become non-functional. It should be addressed more closely within the development of the emergency planning under COMAH

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2 Fear and uncertainty can be considered a direct health effect of the UGS proposal: fear of an environmental hazard, itself, may give rise to anxiety attacks and these may manifest as headaches, hypertension, and other low grade illnesses (5). With regard to open-cast mining, Moffat et al interviewed people who were parents but who were not actively involved in campaign work to oppose mining activity (15). They found that while (adverse) health effects were anticipated the majority of these were not realised. Open cast mining and UGS have different hazards but it is instructive to note this example: fears and concerns are very real and themselves cause health effects. However health effects which are anticipated to be caused by a development do not always occur.
Major incident and societal risk
B.32. The Buncefield report (Board report) (17) states that plans should take account of societal impact from any development for example the potential effect of the proposed development on the local population. It also requires pipeline infrastructure to be considered at the same time as major development.

B.33. Halite is directly addressing issues associated with a major incident and pipeline issues via their QRA process and seek to demonstrate that these have been minimised through the engineering and management solutions. The associated studies which have been conducted, including the HIA and other impact assessments, also seek to ensure the safety, and longer-term sustainability, of the proposed UGS. Consultation with the public and with the statutory consultees has been, and continues to be, an integral part of this process.

Modelling surface impacts from explosion
B.34. The QRA modelled the impact of dispersion of gas under three different sets of possible weather conditions and the worst case was reported, notably those for stability D$^3$ (where D refers to weather conditions on a generally breezy day, regularly experienced in the UK).

B.35. The UK does get prolonged spells when there is little wind, such as the middle of the winter on frosty days, when the lower air becomes trapped near to the earth’s surface. This would affect the way in which escaped gas either disperses, or the way an explosion may occur. Different receptors will be affected depending on wind direction, dispersal rates, etc. Halite notes that most historic major accidents have occurred in calm conditions. This is because during calm conditions potentially flammable gases do not disperse as quickly and are therefore more likely to be ignited.

Major emergency scenario
B.36. The HIA defines major emergency scenario health effects with reference to the population within a 844 metre radius of the main gas storage compound infrastructure, plus a small extension of this area to the northwest. 844 metres has been calculated as the ½ LFL (Lower Flammable Limit) which represents the greatest distance at which there is a risk of major injury in the event of an emergency scenario.$^4$ The

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$^3$ D refers to the mid-point in the Pasquill atmospheric stability classes with A being the most turbulent and F the most stable.

$^4$ The Lower Flammable Limit (LFL) is the lowest concentration of fuel that will burn in air. For Natural Gas, the LFL is about 5% by volume in air. For gas dispersion into a turbulent environment such as the atmosphere, the concentration at a point fluctuates with time, and an average gas concentration equal to the LFL represents the furthest point at which ignition leads to a flame burning back to the source of the release. Local ignitions can take place at average concentrations as low as half the LFL (2.5% for
extension to the northwest is due to risks from jetfire within a 581m radius of wellheads (generally jetfire risks fall within the 844m radius).

B.37. The 844 metres radius encompasses Cote Walls farm, Park Cottage farm and Park Cottage. There are also sections of the 'Wyre Way' within this zone, as well as parts of the Knott End Golf Club and possibly areas used by the Alkali Angling Club. The sewage works building (usually unoccupied) also falls within this area.

Effects from other operators and the faultline
B.38. The effects of fracking on the local geology are unknown. As this is the responsibility of Cuadrilla Resources Ltd (an independent energy company) it is outside Halite’s control. Cuadrilla has commissioned research into the potential effects.

B.39. The geological assessment considers the area suitable for gas storage (19). It has been carried out on the basis of stability, not induced instability. The recent earth tremors are noted above (para B.22). While the proposed caverns are sited within salt beds and are thus stable, the salt beds are embedded in mudstones, and all pipework passes through the mudstones.

B.40. The Geological Conceptual Model shows how the pipework which comes to the well head compound crosses the same fault line in the surface layers of mudstone (1: p10). If external operations change the geology there is a potential for slippage failure of the mudstone.

Cavern failure
B.41. Halite has sought to reassure residents that all engineering will be carried out to modern standards, and that there will be little expectation of failure. The caverns of the proposed UGS are specifically designed to leave a strong halite roof to the caverns, which will support the mudstone (with regard to seismic risk, see 1: para 3.4, p50).

B.42. However, people know that existing caverns have collapsed. The QRA states that decommissioning involves emptying the caverns of gas, filling them with brine and sealing them. The wellheads would then be ‘maintained and monitored in accordance with an approved scheme and in a manner consistent with the ongoing maintenance and monitoring activities being conducted for the decommissioned ICI brine wells’ (1: para 2.6.9.4, p36).

B.43. The review recommends that the QRA provide additional information on how the decommissioned caverns will be maintained to minimise the risk of cavern failure. Halite note that the method for dealing with Natural Gas) (18: p78). ½ LFL distance is the distance needed for an unignited release to disperse to half of the lower flammable limit. Within this distance fatalities could result from a localised flash fire if a delayed ignition were to occur. The flash fire would not, however, be able to burn back to the release location (18: p35).
decommissioned caverns has been shared with HSE and that the report will be issued. Concerns over the integrity of the existing decommissioned caverns was noted in discussion by a member of the Community Liaison Panel (see page 40).

B.44. Halite addressed the failure of brine well 45 (20;21) in an open and transparent manner.

Pipelines

B.45. There are some 6,800 km of pipelines in the UK forming the national gas transmission system (22). The Halite pipeline will link into this network to receive gas for storage and to distribute stored gas to meet demand.

B.46. Emergency procedures and plans are in place for pipelines in the National Network System and Halite will construct the pipelines to the appropriate regulations. The QRA considers problems associated with terrorism at the caverns.

B.47. Halite advises that they have taken the advice of security consultants and that there is a low risk of terrorism associated with this Project. Halite state that they will ensure that the facility will be secure – all areas would be fenced off, infra red cameras and motion monitors would be installed and the site would be manned 24/7.

B.48. The security services are involved in deciding on the appropriate measures, which need to be taken to combat terrorism (22): this applies to the caverns and to the pipelines. Halite state that they will comply with all national requirements regarding safety around terrorism attacks.

B.49. Halite will follow industry best practice in terms of its recruitment policies. They state that they will utilise the services of a specialist recruitment company to select and vet all potential employees. Furthermore, they state that they will, wherever possible, recruit from the local workforce.

B.50. This review notes that the opposition to the project, and indeed the QRA, focus mainly on the storage caverns and not on the pipelines which link the caverns to the National Transmission.

Populations not included in the QRA

B.51. There are a series of fishing ponds in the vicinity of the proposed Wellhead Compound, created from collapsed caverns. It has regular visitors and is used by the Alkali angling club. There is no assessment of risk for these people: the calculation of 1 in a 100 million (per year) is for constant exposure (i.e. 24 hours a day and 7 days a week). The risk associated with the fishing ponds will thus be less.

On-site hazard

B.52. The QRA notes the hazard of up to 12 tonnes of methanol on site (1: para 2.9.1, p38). This is a highly flammable substance. Halite state that it will be stored in a separate bunded compound with its own fire protection and that it is not a hazardous substance under the Hazardous Substances Act.
B.53. Halite state that a methanol fire could be modelled but there is no risk to the public. The HIA team accepts that modelling of a fire for the methanol alone would be likely to demonstrate that it has limited impact on the wider public, and would possibly be limited to the workforce. However, we note that the cumulative effect of a methanol fire in concert with a gas fire may be substantial.

Conclusions
B.54. The conclusions of this review are:
   • the QRA provides a thorough analysis of the risks of failure associated with the proposal; and that
   • the EIA, HIA and other studies will identify and seek to mitigate a wider range of lower-level effects many of which have implications for human health.

B.55. Halite has produced a comprehensive QRA of the operations to create and run underground storage caverns at Preesall.

B.56. If the installation is run and managed appropriately there are very few foreseeable impacts on health for most of the residents. However, if a catastrophic failure should occur, workers at the Wellhead Compound, and at Cote Walls Farm, could be killed or seriously injured.

B.57. The QRA concludes that incidents will be very unlikely to occur as potential problems have been ‘engineered out’, or they will be minimised by effective management structures. The success of the management structures depends on employees following the adopted protocols and procedures. A possible failure is not the engineering, the procedures, or even the desire to operate safely: it is the people within the organisation (operator failure). Therefore the QRA does not state categorically that there will not be problems simply because they have been thought about and will be managed. Management systems may fail. Risk cannot be eliminated: the Protect Wyre Group make a similar point with regard to the blow-out of the brine well in Monks Lane (21).

B.58. The QRA seeks to address the ‘fear factors’ associated with the installation, and through reassurance that all the potential hazards have been taken into account (for example 1: Table 1.1, p11); the potential risks are extremely small. However, health of the general population in the vicinity remains affected by the planning application, as the use of the surrounding area by the general population is outside of Halite’s control. Furthermore, the hazards which are envisaged are catastrophic ones.

B.59. Though the reassurances the QRA has produced are based on sound scientific evidence, there will be an element of the population for whom there remains a very real fear of catastrophe.

B.60. If the proposal is passed by the Infrastructure Planning Commission Halite will undertake detailed emergency planning. Many of the consultation comments seek certainty about the emergency response in
the event of a catastrophic incident. While it is not possible to begin detailed emergency planning at this stage we recommend that as much information as possible is given about this process, for example: the organisations which will be involved, statutory and local, and the types of activities that will take place.

**Summary of recommendations**

**B.61.** That shut-off valves be fitted on both sides of all pipes that cross the fault.

**B.62.** That there is additional information on how the decommissioned caverns will be maintained to minimise the risk of cavern failure.
C Scoping Summary
C.1. This appendix sets out a summary of the scoping exercise and the early stages of the assessment that were undertaken for this HIA.
C.2. The team prepared a scoping document and a preliminary assessment.
C.3. The scope and preliminary assessment was informed by a review of the literature including academic research, local reports, debate amongst the HIA team, and discussion with the client and the Steering Group.
C.4. The documents also drew on the Preliminary Environmental Statement, the Quantitative Risk Assessment and summary of consultation activities.
C.5. Each of these documents was presented to, and subsequently discussed with, the Steering Group. Steering Group comments were incorporated into subsequent analysis.
C.6. Through this process forty six issues were identified as being potential pathways by which the project could affect human health in either a beneficial or an adverse way.
C.7. These were examined in the scope and preliminary assessment. This took place in advance of the results from the Environmental Statement. When results began to emerge from the ES the HIA team were able to proceed with the HIA. The scoping summary covers the entire scoping exercise, which remained open to new information up to the point of finalising the HIA report.
C.8. Thus, the scoping and preliminary assessment documents provide a historical record of the HIA process but they are not based on the most up to date information about the proposed project.
C.9. The following sections summarise the scoping and preliminary assessment and provide a record of why issues were included, or excluded, from the study.
C.10. Each issue was considered against the following project stages or scenarios:
  • construction activities;
  • normal operational activities;
  • fear of emergency scenarios;
  • actual emergency scenarios; and
  • decommissioning
C.11. For each issue the following population groups were considered:
  • construction workforce;
  • operational workforce;
people resident within 844 metres of the centre of the GCC (and 581 metres from wellheads);
people working within 844m of the centre of the GCC (and 581 metres from wellheads);
people engaged in leisure / recreational activities 844 metres of the centre of the GCC (and 581 metres from wellheads);
Wyre Estuary and Preesall to Nateby Study Area;
Fylde Peninsula Study Area;
Irish Sea Study Area;
equity groups;
Lancashire County Council;
Blackpool Council;
Wyre Borough Council;
Fylde Borough Council;
North Lancashire Teaching PCT;
Blackpool PCT;
Cumbria & Lancashire Health Protection Unit;
Wider NHS;
Fire brigade;
Coast guard;
Community Liaison Panel;
Tenants Group;
Regional population;
National population

C.12. The following sections set out the scoping rationale for each issue.

**Resilience to sea level rise**

C.13. What are the potential legacy issues of coastal flooding beyond the next fifty years? This related to the way in which a changing climate and rising sea levels could affect the decommissioned site.

C.14. Adverse health effects from coastal or fluvial flooding linked to sea level rise during the construction and operation stages were regarded as unlikely given the resilience measures which would be discussed in the ES and developed in conjunction with the Environment Agency.

C.15. The potential pathways by which people may be exposed were also considered. The decommissioned caverns will be filled with brine. This brine may become polluted by petrochemical residues linked to the maintenance of the caverns. The decommissioning process installs an impermeable cap, which would act as a barrier to the pollution of flood waters, so the caverns would be unlikely to release such water even in the event of becoming submerged.

C.16. On this basis the HIA concluded that no pollutant linkage pathway existed to affect human health and this issue could be scoped out.

**Resilience to extreme weather events**

C.17. What is the potential impact of extreme weather on the proposed development? This issue covers scenarios such as reduced access to
the operational site and safety impacts of extreme weather for the facility itself.

C.18. The HIA noted that the scheme design minimises the risks of extreme weather events affecting the safety of the facilities. If required the facility has subterranean isolation valves to contain the stored gas should surface facilities be unable to operate.

C.19. On this basis the HIA determined that this issue could be fully scoped out.

Supply during winter shortages
C.20. Would the additional energy storage offered by the project benefit local populations during colder winters associated with climate change?

C.21. The HIA concluded that although the additional storage offered by the scheme would reduce the likelihood of national gas shortages during cold periods, the effects experienced on the local population are likely to be minimal.

C.22. Given that the regional and national level benefits are considered separately under the ‘national energy supply security’ issue, the HIA determined that this issue could be fully scoped out.

Plant & vehicle emissions
C.23. Will the emissions to air from construction and operational plant and vehicles pose a risk to health?

C.24. The HIA evidence review noted findings from COMEAP and other sources that many emissions to air are harmful to human health. The Environmental Statement examines particulate matter, nitrous oxides, sulphur dioxide.

C.25. The preliminary environmental assessment concluded that construction and operational vehicles were unlikely to result in local air pollutant concentrations approaching the thresholds of the UK air quality standards. [Based on the relatively low numbers of vehicles and the absence of existing air quality problems in the areas in which they would operate].

C.26. Further consideration was given to plant emissions from the solution mining process and operational gas storage (including dehydration furnace and heating boilers).

C.27. In considering potential exposure pathways for plant emissions the HIA noted that:

- there will be few receptors close to the points of emission (i.e. the gas compressor compound);
- emissions will be made via stacks and exhausts which facilitate dispersion; and
- the site is not within an Air Quality Management Area (AQMA); and
• emissions will be regulated by discharge permits.

C.28. These factors suggested that of air quality standards would be unlikely to be exceeded.

C.29. The HIA concluded that air quality should be scoped in for further assessment to consider the emerging detailed emissions data of the ES.

Dust (including $\text{PM}_{10}$ & $\text{PM}_{2.5}$)

C.30. What will be the effects of dust generation during the construction and operation of the proposed development? Two types of dust were of interest:

• nuisance dust, consisting of larger particles which do not penetrate the lungs if inhaled, but which cause a nuisance when deposited on property; and
• fine dust or particulate matter ($\text{PM}_{10}$ and $\text{PM}_{2.5}$) which can be drawn deep into the lungs if inhaled, potentially causing adverse health effects at any concentration.

C.31. No operational sources of nuisance dust were identified. Consequently the HIA concluded that operational nuisance dust effects could be scoped out.

C.32. As construction ground works and activities such as drilling had the potential to create nuisance dust the HIA considered the potential exposure pathways in more detail.

C.33. In considering potential exposure pathways for nuisance construction dust the HIA noted that:

• at the main site there are few receptors within the area where dust effects would be expected to be experienced;
• at the smaller pump-house sites the limited construction suggests there will not be a large amount of fugitive dust, although there may be more receptors within the potential dust deposition radius;
• the pipeline and cable works will be mostly bored (rather than trenched) so dust generation will be minimal; and
• the ES was expected to include dust suppression mitigations.

C.34. On this basis the HIA concluded that construction nuisance dust effects could be scoped out. [In the final report the HIA team reviewed and reported on construction dust effects.]

C.35. Fine dust or particulate matter were scoped in from both operational and construction sources: particulates of respiratory size are not expected to be a major feature of the proposed development, however, there is no lower limit associated with levels of fine particulate matter where health effects will not occur.

C.36. Particulate matter is addressed in the HIA results as a combined section of plant & vehicle emission and particulate matter ($\text{PM}_{10}$ and $\text{PM}_{2.5}$).
C.37. The mobilisation of ground contaminants as fine air borne particulates (from excavation or drilling) is considered as part of the particulate matter scope.

**Odour nuisance**

C.38. Will the construction and operation of the proposed development create odour for the local population?

C.39. The natural gas stored at the UGS facility will not have been odorised.

C.40. The proposed development will only cause odour nuisance if currently unknown odorous material is disturbed during the construction process. There is existing contaminated ground around the Redrow residential development.

C.41. The HIA concluded that odour associated with the disturbance of old landfill waste during construction excavations should be scoped in for further assessment. All other sources of odour were scoped out.

**Natural gas releases**

C.42. What are the potential health effects relating to the release to the atmosphere of any natural gas stored on the site (for example routine maintenance & controlled emergency releases)?

C.43. A review of the scheme identified that whilst controlled natural gas releases may occur during maintenance or as an emergency measure, these would be a last resort. Prior to considering release there are options to either pipe the gas into the National Transmission System, or into another gas storage cavern.

C.44. In considering potential exposure pathways the HIA noted that in the event of a controlled release to atmosphere there are few receptors in the immediate vicinity of the gas compressor compound; and due to the buoyant nature of natural gas and the controlled manner in which it would be released it would rapidly disperse upwards reaching levels of dispersion (concentrations in air) beyond both an asphyxiation risk and a flammable risk.

C.45. On this basis the HIA determined that this issue could be fully scoped out. Uncontrolled releases of natural gas during an emergency scenario are considered under a separate ‘structural failure’ issue.

**Flood risk to facilities**

C.46. What are the potential flood risks to the proposed development?

C.47. This was scoped out due to the fact that the project had completed a flood risk assessment and that appropriate consideration would be given to flood resilience measures including consultation and discussion with the Environment Agency.
C.48. On this basis the HIA determined that this issue could be fully scoped out. [Flood damage resulting in an emergency scenario is considered under the separate ‘structural failure’ issue].

**Impact on sea defences**

C.49. Are there potential flood risks associated with changes to the local sea defences during the proposed development’s construction works?

C.50. The development includes temporarily breaching the sea defences at Fleetwood to install a pipeline into the Irish Sea.

C.51. As for the topic above, this was scoped out due to the fact that the project had completed a flood risk assessment and that appropriate consideration would be given to the seawall including consultation and discussion with the Environment Agency.

C.52. On this basis the HIA determined that this issue could be fully scoped out.

**Surface water contamination**

C.53. Is there a potential for adverse health effects from contamination of surface waters as a result of the proposed development?

C.54. A review of the scheme identified that potential pollutants to surface water will be managed and monitored. Furthermore the ES coverage of impacts to the water environment did not identify any significant residual effects.

C.55. On this basis the HIA determined that this issue could be fully scoped out.

**Ground water contamination**

C.56. Are there potential legacy issues of contaminated water leaching into groundwater from decommissioned caverns (with potential human health outcomes further along the pollution linkage pathway)?

C.57. The potential pathways by which people may be exposed were also considered. The decommissioned caverns will be filled with brine. This brine may become polluted by petrochemical residues linked to the storage of natural gas.

C.58. The caverns are very unlikely to lose this water because the fluid nature of the halite rock formation causes it to ‘heal’ any fractures that occur. The halite is also impermeable to water. It will have only a brief period where further halite dissolves as the brine becomes a hypersaline solution.

C.59. On this basis the HIA concluded that, due to analysis demonstrating the durability of the caverns’ structural stability, there are not likely to be pathways that pose a risk to human health.

C.60. Consequently the HIA determined that this issue could be scoped out.
Ground contamination
C.61. What is the potential for ground contamination associated with the proposed development?

C.62. Operational effects with the potential to pollute soil and geology will be managed and monitored. Furthermore any hazardous solid wastes will be disposed of using specialist waste contractors and under appropriate regulatory permits.

C.63. Consideration of potential exposure pathways associated with construction contamination pathways noted that whilst residues from the solution mining process would be disposed of in existing old salt caverns onsite, the residues are not in themselves hazardous substances and any failure in the integrity of these old caverns would bury the residues, not expose them.

C.64. On this basis the HIA concluded that pathways by which human health would be affected were unlikely and thus this issue could be scoped out.

C.65. Health effects arising from legacy issues of contaminated ground following decommissioning were scoped out as this will be subject to regulated remediation.

C.66. [There is existing contaminated ground around the Redrow residential development. The proposed development is not anticipated to add to this pollution. It may however mobilise it during construction excavations as dust. There may also be odours released. This is considered with regard to particulate matter and odour].

Land take (including farmland)
C.67. What is the potential for adverse health effects from land take required for the proposed development?

C.68. The HIA noted that the scheme requires the loss of some versatile farm land. The loss is relatively small and is not thought likely to affect local employment or food production.

C.69. Consequently the HIA determined that this issue could be scoped out.

Structural failure: wellhead; pipework; or equipment failure
C.70. What are the potential health effects in the event of an emergency scenario at the operational gas storage facility?

C.71. The HIA noted that although heavily regulated (including the Pipelines Safety Regulations, COMAH regulatory requirements and European Standard BS EN 1918:1998) the possibility of a catastrophic failure cannot be ruled out.

C.72. The HIA determined that more detailed investigation was required, including a review of the project’s Quantitative Risk Assessment report, in order to set out the potential health effects associated with a large uncontrolled gas release. The results were considered in tandem with
the public fears about safety arising from the proposed development (see page 27).

C.73. On this basis structural failure was included.

Visual setting & local character
C.74. What is the potential visual impact of the proposed development?
C.75. A review of the scheme identified that the main surface infrastructure would be of an industrial character, which may not be in keeping with the predominantly agricultural setting.
C.76. The HIA also noted the potential benefits of the subterranean storage option minimising above ground visual impacts.
C.77. On this basis potential effects to visual setting and local character were scoped in for further assessment.

Noise disturbance
C.78. What are the potential noise effects of the proposed development?
C.79. A review of the scheme identified the presence of residential populations close to both construction and operational noise sources. Notable areas of potential effect were identified as being the northern and southern river crossings (construction drilling and operational pump plant).
C.80. The HIA also noted the potential for general levels of tranquillity to be affected by noise, such that the character of the area could be changed.
C.81. The HIA concluded that noise disturbance should be scoped in for further assessment to consider the emerging detailed data of the ES.

Vibration disturbance
C.82. Will the proposed development have vibration effects?
C.83. A review of the scheme identified the presence of residential populations close to areas of construction and operational activity.
C.84. Vibration effects tend to dissipate rapidly with distance, however, a lack of information on the capacity for construction and operational plant to cause vibration (including cavern vibration) meant that vibration effects remained in the scope.

Light disturbance (night)
C.85. Will light sources from the development, during either construction or operation, have the potential to interfere with sleep?
C.86. Operational night-time lighting of the gas compressor compound may increase its visibility within the landscape. However given the distance of all but one residential property, it is unlikely that the lighting would be experienced at levels to cause sleep disturbance.
C.87. The closest residential property is Cote Walls Farm. Mitigation for night lighting will be provided if required.

C.88. Some construction compounds will also be lit at night. Information from the ES landscape and visual impact assessment identified that generally such lighting would be for a limited duration and at levels that were unlikely to be intrusive, the exception being the directional flood lighting required around wellheads during drilling. The HIA scoping concluded that whilst such wellhead lighting would be noticeable within the night landscape it was not anticipated to be close enough to residential receptors to disturb sleep.

C.89. Consequently the HIA determined that this issue could be scoped out.

Severance of communities or amenities
C.90. Will the development reduce access to community amenities from footpath or right-of-way closures?

C.91. The construction phase will require the temporary closure of some footpaths and public rights-of-way.

C.92. The HIA noted that whilst such closures may affect opportunities for physical activity, these routes are not main links between communities or community amenities. Severance of communities or their amenities as a result of the temporary closures is therefore unlikely.

C.93. Consequently the HIA determined that this issue could be fully scoped out.

C.94. [Potential effects of community severance due to traffic associated with the scheme are considered under the ‘traffic impacts’ issue and the potential effects of reduced physical activity from footpath or right-of-way closures are considered under the ‘use of recreational amenities’ issue].

Traffic impacts (traffic movement)
C.95. What are the potential traffic effect during the construction, operational and decommissioning stages?

C.96. A review of the scheme identified that there was the potential for the local transport network to be adversely affected by increased traffic, particularly HGVs.

C.97. Traffic impacts were also a recurring theme of the public consultations of both the current and previous planning applications for UGS at the site. The traffic effects were raised in discussion by a member of the Community Liaison Panel (see page 40).

C.98. The HIA concluded that traffic impacts should be scoped in for further assessment to consider the emerging detailed data of the ES and Transport Assessment.
Congestion of local transport network
C.99. Is there a potential for congestion on the local transport network as a result of road closures to enable pipeline and cable laying associated with the project?

C.100. When underground cables or pipelines cross roads the scheme plans to use boring rather than trenching. This method of installing the cables or pipelines under the roads is less likely to cause disruption to traffic.

C.101. Consequently the HIA determined that this issue could be scoped out.

Impact on airport flight paths
C.102. Is there a potential for airport flight paths to be affected by the scheme?

C.103. The Quantitative Risk Assessment concludes that flight paths were unlikely to be affected by the scheme.

C.104. Consequently the HIA determined that this issue could be scoped out.

Employment market
C.105. Is there a potential for the project to bring employment opportunities to the local area?

C.106. During the construction phase the project would employ around 300 workers and during the operational phase around 35 workers. Furthermore the scheme would make use of other local services, thereby indirectly supporting employment.

C.107. The HIA noted the importance of such jobs in a local context of high unemployment in Fleetwood.

C.108. Consequently the HIA determined that effects to the local employment market should be scoped in for further assessment.

Electromagnetic field exposure
C.109. Is there potential for adverse health effects from electromagnetic field exposure associated with the proposed development?

C.110. In common with other electrical infrastructure, substations generate an electromagnetic field. Concerns have been raised regarding the health effects of prolonged exposure to high intensity electromagnetic fields. Currently the scientific literature has not established a causal link between electromagnetic fields and adverse health outcomes (though a considerable body of research has been undertaken).

C.111. A review of the scheme identified that the solution mining process and elements of the operational storage of natural gas are energy intensive. Electrical substations will therefore be required as part of the scheme.

C.112. Given that the substations will not be placed directly adjacent to areas normally occupied, the HIA determined that this issue could be scoped out.
Use of NHS, LA & community resources
C.113. Is there potential for increased use of NHS, LA & community resources as a result of stress, anxiety or depression associated with the scheme?

C.114. Due to fears about underground gas storage some people may experience increased stress, anxiety or depression. Treatment of such conditions – and any aggravation that these conditions cause to other medical conditions – could draw upon NHS and community resources.

C.115. The numbers of people who are likely to experience adverse mental health conditions to a level that requires significant additional NHS or community resources was expected to be low.

C.116. The HIA also noted that other factors could potentially balance any increase in resource use. For example raised levels of employment (with associated improvement in mental and physical health) may decrease NHS or community resources service requirements.

C.117. On the basis that there were unlikely to be large resource implications the HIA determined that this issue could be scoped out.

Use of marine, estuarine and terrestrial ecosystems
C.118. Is there a potential for a change in the use of areas around the proposed development as a result of the development’s effects on ecosystem quality?

C.119. With regard to the marine environment, the HIA noted that although there may be potential for some localised disruption around the outlet of the outfall (due to the hypersaline conditions being unsuitable for marine species), this will be 2.3km offshore, in an area not usually used by local populations.

C.120. With regard to the estuarine and terrestrial environments, the HIA noted that although there may be some localised disruption of these ecosystems largely as a result of noise disturbance (from surface infrastructure and solution mining), the majority of species are likely to adapt quickly (thus maintaining ecosystem quality).

C.121. The HIA concluded that any impacts to ecosystem quality are likely to be limited and therefore any associated reduction in amenity value is also likely to be limited.

C.122. On the basis that there were unlikely to be population health impacts the HIA determined that this issue could be fully scoped out.

C.123. A similar pathway is described below for change in use of the environment due to development disturbance disrupting leisure opportunities (as opposed to ecosystems). These two pathways are interlinked and both address aspects of change in amenity value.
Use of marine, estuarine and terrestrial leisure opportunities

C.124. Is there a potential for a change in the use of areas around the proposed development as a result of the development’s effects on ecosystem quality?

C.125. The construction related disturbance of these environments is likely to be short-term and localised: this will occur as the surface infrastructure is installed and as the underground cables and hypersaline fluid discharge pipeline are laid. The construction of the caverns themselves would not be visible, but may have associated plant noise.

C.126. The surrounding area supports a variety of leisure pursuits including: walking, cycling, horse riding, golf, sailing and fishing. The effects on kite-surfers, of the discharge pipe in the sea, were raised in discussion by a member of the Community Liaison Panel (see page 40).

C.127. Based on the potential for localised disturbance, particularly during the construction phase and there being a range of leisure pursuits that could be affected, the HIA concluded that disruption of leisure opportunities should be scoped in for further assessment.

C.128. [A similar pathway is described above for change in use of the environment due to development disturbance disrupting ecosystems (as opposed to leisure opportunities). These two pathways are interlinked and both address aspects of change in amenity value].

Staff training opportunities

C.129. Is there potential for health benefits from people employed by the scheme completing qualifications or training (career progression)?

C.130. Training and career progression opportunities will be available. Due to the relatively small numbers involved, and the fact that this is covered by the benefits noted in the ‘employment market’ issue, the HIA scoping determined that this issue could be scoped out.

Local investment & regeneration

C.131. Is there a potential for benefits of local capital investment due to the scheme, which may result in wider wealth creation for local populations, regeneration, or create markets for other local businesses?

C.132. The project plans to use local services during the construction phase of the project. Such activity would bring community benefits and wealth creation.

C.133. The HIA noted that the majority of local economic benefits were gained via employment opportunities. The additional benefits to the local economy whilst beneficial and further explored in the ES, were not expected to result in important population level health effects.

C.134. Consequently this issue was scoped out from the HIA.
National gas supply security
C.135. Is there a potential for benefits from improved national energy supply security?

C.136. A review of the scheme identified that the 900 million cubic metres of gas storage offered by the scheme represents an important contribution to national energy supply security.

C.137. The HIA noted that increased national resilience to energy shortages could avoid widespread adverse health effects from the loss of electricity, heating and service provision.

C.138. On this basis the HIA concluded that improved national gas supply security should be scoped in for further assessment.

Tourism
C.139. Will the UGS development affect people’s willingness to visit the area or invest in local tourism?

C.140. A review of the Quantitative Risk Assessment identified that the area where actual risks arise due to gas storage provides a very small contribution to local tourism.

C.141. However the HIA noted that a wider area may experience a decline in tourism and investment in tourism due to fears of emergency scenarios which are not consistent with risks reported by the Quantitative Risk Assessment. Furthermore tourists’ decisions may be very sensitive to publicised local issues.

C.142. On this basis potential impacts on tourism were scoped in for further assessment.

C.143. [This issue is linked with the impact on local businesses below].

Local businesses (including farms)
C.144. Will the proposed development influence people’s willingness to visit, buy from or invest in local businesses?

C.145. There are a small number of businesses, which could potentially be affected by fears of emergency scenarios. These include farming of the adjacent land and a golf course (to the north).

C.146. Health effects were considered unlikely from this issue especially as there is substantial overlap with the analysis for tourism.

C.147. Consequently the HIA determined that this issue could be scoped out.

C.148. This issue is linked with the impact on tourism above.

C.149. Beneficial employment and local economy affects relevant to local business are addressed separately in the issues of ‘employment market’ and ‘local investment and regeneration’ above.
Housing market & property value
C.150. Will the proposed development affect the market value of property in the area [for example blight]?

C.151. There are few residential properties in proximity to the compressor compound or gas storage areas. Consequently effect on house prices is likely to be limited.

C.152. On this basis the HIA concluded that potential impacts on the housing market could be fully scoped out.

Energy market (cheaper gas supply)
C.153. Will the additional natural gas storage offered by the proposed development affect energy costs?

C.154. The scheme would contribute to greater national gas storage. Energy costs are linked to many factors and it is not feasible to link this proposed development to changes in gas prices and potential changes in health outcomes.

C.155. This issue was scoped out.

Perceived safety fears
C.156. What is the potential for adverse health effects from perceived fears around the safety of the scheme?

C.157. The Quantitative Risk Assessment identified a small area where actual risks arise due to gas storage. This has one residential receptor.

C.158. People in a wider area have expressed opposition to the development. This may cause an increase in stress, anxiety or depression due to fears about safety.

C.159. The public consultation for the development provided detailed information about the risks of the proposed development. People were therefore likely to be better informed about the actual risks. The extent of fears about the development were unclear the HIA determined that this issue should be scoped in for further assessment.

C.160. [This issue links with other aspects of perceptions about the project’s safety including the issues of ‘tourism’, ‘local businesses’ and ‘housing market & property value’].

Stakeholder engagement
C.161. Will social capital have been affected by the proposed development?

C.162. Important benefits can accrue from community engagement and debate.

C.163. This issue was scoped in for further assessment.
Pollution of land used for food / crops
C.164. Will chemicals originating from the gas storage caverns be deposited onto crops, or soil used for growing crops, at levels that could pose a risk to human health?

C.165. A review of the scheme identified that there is potential for petrochemical residues associated with the gas storage process to be released to the atmosphere and then precipitated onto surrounding crops. The conditions for this to occur are unlikely and the concentrations involved were likely to be negligible.

C.166. The HIA also noted that the ES modelled low levels of SO$_2$ and NOx deposition associated with the proposed development emissions to air.

C.167. On this basis the HIA concluded that no pollutant linkage pathway existed to affect human health and thus this issue could be fully scoped out.

Use of recreational amenities
C.168. Will the closure of footpaths or rights-of-way during construction affect levels of physical activity?

C.169. The construction phase will require the temporary closure of some footpaths and public rights-of-way.

C.170. Temporary closures of some footpaths and public rights-of-way could reduce the opportunities for local populations to derive the benefits of exercise.

C.171. This issue was scoped in for further assessment.

Safe working environment
C.172. Is there a potential for adverse health risks to the projects workforce in the event of a catastrophic event?

C.173. The Quantitative Risk Assessment identified that in the event of an emergency scenario the risks of major injury diminish rapidly with distance from the source.

C.174. The risks that some members of the site workforce will experience are addressed in the issue of ‘structural failure’ above.

C.175. Consequently the HIA determined that the risks to the workforce did not need to be scoped in as a separate issue. This issue was therefore scoped out.
### Summary of Underground Gas Storage facilities using salt caverns in Britain

#### Table D.1: Preesall salt cavern gas storage

<table>
<thead>
<tr>
<th>Area</th>
<th>Site</th>
<th>Storage Capacity (Mcm)</th>
<th>Number of Caverns</th>
<th>Approx. depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW England</td>
<td>Preesall</td>
<td>900</td>
<td>19</td>
<td>317 - 459</td>
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</table>

#### Table D.2: Operational salt caverns (2008 data).

<table>
<thead>
<tr>
<th>Area</th>
<th>Site</th>
<th>Storage Capacity (Mcm)</th>
<th>Number of Caverns</th>
<th>Approx. Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheshire Basin</td>
<td>Holford H-165</td>
<td>0.175</td>
<td>1</td>
<td>350 - 420</td>
</tr>
<tr>
<td>Cheshire Basin</td>
<td>Hote House Farm</td>
<td>75</td>
<td>4</td>
<td>300 - 400</td>
</tr>
<tr>
<td>East Yorkshire</td>
<td>Hornsea / Atwick</td>
<td>325</td>
<td>9</td>
<td>c. 1720 - 1820</td>
</tr>
<tr>
<td>Teesside</td>
<td>Saltholme</td>
<td>0.2</td>
<td>18 (+ 9 redundant)</td>
<td>350 - 390</td>
</tr>
<tr>
<td>Teesside</td>
<td>Saltholme</td>
<td>0.08</td>
<td>4</td>
<td>340 - 370</td>
</tr>
<tr>
<td>Teesside</td>
<td>Wilton</td>
<td>0.04</td>
<td>5(+ 3 redundant)</td>
<td>650 - 680</td>
</tr>
<tr>
<td>Teesside</td>
<td>Wilton</td>
<td>Unknown</td>
<td>2</td>
<td>650 - 680</td>
</tr>
</tbody>
</table>

Source: HSE (23).
Table D.3: Planned salt caverns (2008 data).

<table>
<thead>
<tr>
<th>Area</th>
<th>Site</th>
<th>Storage Capacity (Mcm)</th>
<th>Number of Caverns</th>
<th>Approx. depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheshire Basin</td>
<td>Byley / Holford</td>
<td>160 -170</td>
<td>8</td>
<td>630 -730</td>
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<tr>
<td>Cheshire Basin</td>
<td>Stublach</td>
<td>540</td>
<td>28</td>
<td>550 – 560</td>
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Source: HSE (23).
Figure D.1: Distribution of the main halite bearing basins in Britain and the location of operational and proposed underground gas storage sites

Source: HSE (23).
E Population estimates for Wyre LSAOs

Source: http://www.lancashire.gov.uk/

E.1. The following data provides population estimates for Wyre. Equivalent data is not reproduced for Fylde as it is considered too geographically removed to experience important population level health effects (although there may be some benefit from employment opportunities).

E.2. This data should be considered in conjunction with Figure 5.3 of the main HIA report that shows the geographical locations of the Wyre Lower Super Output Areas.

E.3. The total population is calculated from the mid-2005 population estimates, adjusted to remove prisoner counts and rounded to the nearest ten.

E.4. The working-age population is calculated from the mid-2005 population estimates for males aged 18 to 64 and females aged 18 to 59, adjusted to remove prisoner counts and rounded to the nearest 10.

E.5. The child population is calculated from the mid-2005 population estimates for children aged 0 to 15, adjusted to remove prisoner counts and rounded to the nearest 10.

E.6. The older population is calculated from the mid-2005 population estimates for people aged 60 or over, adjusted to remove prisoner counts and rounded to the nearest 10.
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<td>720</td>
<td>370</td>
<td>230</td>
</tr>
<tr>
<td>Wyre 002C</td>
<td>1,650</td>
<td>860</td>
<td>350</td>
<td>430</td>
</tr>
<tr>
<td>Wyre 002D</td>
<td>1,610</td>
<td>870</td>
<td>310</td>
<td>410</td>
</tr>
<tr>
<td>Wyresdale</td>
<td>1,980</td>
<td>1,100</td>
<td>360</td>
<td>540</td>
</tr>
<tr>
<td>Wyre 006C</td>
<td>1,980</td>
<td>1,100</td>
<td>360</td>
<td>540</td>
</tr>
</tbody>
</table>

I know that this is a direct lift, but frankly I think it is a waste of time, as it does not discriminate at all for the areas which are of importance: moreover, it brings in areas which have no possibility of being affected, such as Blackburn, Chorley, etc. Unless we know why we want this data, in which case refine it, I suggest that this is relegated to the ame [place as the rest of the historical data.
Full application boundary
This map is available in a larger size in the Environmental Statement

Figure F.1: Full Application Boundary

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G Sources included in HIA scoping rapid literature review

The scoping exercise conducted a rapid review of the following documents.

Advantica, Portland Gas Storage, Safety Report, March 2007, 6251, Issue: 1.1


D J Evans (BGS), An appraisal of underground gas storage technologies and incidents, for the development of risk assessment methodology, Health and Safety Executive, Research Report RR605, 2008


Deborah Keeley (Health and Safety Laboratory), Failure rates for underground gas storage, Health and Safety Executive, 2008, Research Report RR671

Development Regulatory Committee, Stublach UGS, Decision Paper 10, 2006, Ref: 4/05/2102/FZ5, NGR: 711 708

EDF Energy, Hinkley Point C, Proposed Nuclear Development, Pre-Application Consultation – Stage 2, Health Impact Assessment, 2010


Halite Energy Group, Non-Technical Summary of PEI, March 2010, 0005-WX40004-NHR-01

Halite Energy Group, Planning Application Risk Assessment, March 2010, 277663_003_01

Halite Energy Group, Preliminary Environmental Information, March 2010, Final Draft 4-3-11 0003-WX40004-NHR-03

Halite Energy Group, Proposed Underground Gas Storage Facility Preesall Lancashire, Consultation Strategy and Statement of Community Consultation, April 2011

IPC Planning Commission, Preesall Scoping Opinion, November 2010, 101126_EN030001_345802

Risktec Solutions Limited, Preliminary Design Major Accident Safety Report for King Street Gas Storage Facility, 2007, NPL-01-R-01, Issue: 3.0
RSK Environment Ltd, King Street Gas Storage Project, Human and Socio-economic Impact section of Environmental Statement, 2007, RSK/HE/P40276/05/Section 12 Rev02

Watson S, Metcalfe R, Bond A (Quintessa Limited), Scoping calculations for releases from potential UK underground gas storage facilities, Health and Safety Executive, Research Report RR606, 2008
Notes from interview with CLP member

Notes of tel. conference: Lesley Middleton, Community Liaison Panel (LM); and Ben Cave, Ben Cave Associates Ltd (BC).

Date: 20th September 2011
Time: 1630-1700

H.1. Ben Cave had sent an outline agenda. This was agreed. It was used to structure the discussion. In turn, the agenda items are used to structure these notes.

Introductions
H.2. Short introductions were made.

Outline of the Proposals for UGS at Preesall
H.3. BC described in brief the proposals for Underground Gas Storage at Preesall.
H.4. LM described her role as a CLP member. She explained that her role was to remain impartial.

Health Impact Assessment

Approach
H.5. BC explained that Health Impact Assessment (HIA) identifies the potential effects on health, both beneficial and adverse, that the proposed project might have. The HIA team advises Halite on ways to minimise potential adverse effects and maximise potential beneficial effects.

H.6. The HIA team are using the World Health Organization definition of health.

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

H.7. Factors that are important for the health of a population are called determinants of health and include employment, transport, housing etc that can improve and protect health as well as things that might harm health.

H.8. BC described the approach that is being taken in the HIA: namely to work with the specialists who are undertaking the Environmental Impact Assessment (EIA); to maintain a dialogue on issues that affect health and the environment; to ensure that the HIA refers to the EIA where appropriate; and to ensure that, where appropriate, the HIA conducts specialist analysis of health issues.
H.9. BC also described the Steering Group who are overseeing the HIA work. The Steering Group is chaired by the Assistant Director of Public Health from NHS North Lancashire and includes representatives from the Health Protection Agency, Wyre Borough Council and Halite.

Topics

H.10. We discussed the topics that the HIA will look at. This includes noise, air quality, employment and transport. The HIA is also looking at the Quantitative Risk Assessment that Halite have prepared.

H.11. LM identified a number of issues with the proposal:

- Impact on traffic. The Preesall UGS is one of four major projects in the surrounding area [Wyre Power; Wyre Barrage; fracking by Cuadrilla].
- The access to the Preesall site is tricky. The heavy plant machinery will have to move along some small roads. There is concern about possibility of accidents.
- Poulton-le-Fylde is on the edge of the affected area. It currently has an Air Quality Management Area (AQMA) in the centre. The construction traffic using Poulton’s arterial roads will increase traffic and potentially have a knock on effect on pollution and worsen the air quality.
- Brine Well 45. It seemed that this blowout might have been sabotage. This now appears unlikely. Other brine wells contain mercury. How will these old wells be managed? Will the proposed works disturb the existing wells?
- Fracking is being conducted in the surrounding area. There have been two minor earthquakes. LM stated that this had added to concerns about the current proposal and the fault line.

H.12. It was agreed that safety is of paramount importance and that people have expressed fear of the proposal. LM stated that the information Halite has provided has been very good. LM also stated that this information will not convince all members of the local population. The Protect Wyre Group continue to voice concerns.

H.13. LM stated that the existing wells and membranes were of great concern.

H.14. LM noted that the proposal will bring some local employment to the area and that this is positive.

H.15. The contribution of the storage facility to the national reserves of gas is also a positive effect.

H.16. The uncertainty is difficult and is causing some residents real concern. If Halite are 100% certain then they should go for it. History shows that if things go wrong, then they go badly wrong.

H.17. Brine discharge at bottom of sea:

- Halite have assured CLP, and others, that the levels of salt will have returned to normal within a few metres of the outflow. LM
expressed concern that the outflow would kill all life on the sea
bed, albeit in the small area surrounding it. An accident with the
pipe could cause much damage.

- As yet it was not known how the new promenade at Cleveleys
  and the new sea-front at Blackpool would affect the modelling
  of the tide levels. When the tide is out could it be that the brine
  outlet would be nearer the surface than currently expected?
- How will the kite surfers be affected by the discharge?

Consultation
H.18. BC explained that the HIA team would be keen to talk to other CLP
members. LM stated that she would inform her colleagues.

Any other business
H.19. No further matters.

H.20. Conference concluded at 1700.
List of references


15. Moffat S, Pless-Mulloli T. "It wasn't the plague we expected." Parents' perceptions of the health and environmental impact of opencast coal mining. Social Science and Medicine 2003;57(3):437-51.


22. Health and Safety Executive. Pipelines and gas supply industry: frequently asked