5.0 ALTERNATIVES AND DESIGN EVOLUTION

Introduction

5.1 Under the EIA Regulations (Ref. 5.1), an ES is required to provide:

> ***"...an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects."***

5.2 This chapter of the ES identifies the main alternatives to the Proposed Development, which have been considered by the Applicant and describes the environmental considerations, constraints and opportunities which have influenced the design of the Proposed Development.

Alternatives

5.3 The alternatives to the Proposed Development, which have been considered by the Applicant, include:

1. No Development;
2. Alternative locations for the well site;
3. Alternative methods for treating gas;
4. Alternative pipeline routes; and
5. Alternative designs.

1. The 'No Development' Alternative

5.4 The 'No Development' alternative comprises leaving Ebberston Moor 'A' Well Site in its restored state, namely woodland, in accordance with the restoration scheme approved when the well site was granted temporary planning permission in 2011 and 2013 (NYM/2011/0761/FL and NYM/2013/0068/FL respectively). In addition no pipeline would be constructed from the well site to Knapton Generating Station (KGS). This would result in no corresponding adverse effects arising from traffic, landscape, ecology, noise or air emissions associated with the construction, operation or decommissioning and restoration of the Proposed Development.

5.5 Under this planning application, the Ebberston Moor 'A' Well Site is expected to produce up to 15 mmscf/d of gas which would then be transferred via the pipeline to KGS to be used as

fuel-gas to generate power. Without this and other on-shore reserves, the risk to UK gas supply will increase as the country becomes more dependent on imported gas supplies. This will lead the UK's gas supply to become more susceptible to volatile markets outside the control of the UK, particularly during cold winter periods when there is likely to be a greater risk of gas supply shortages.

5.6 To proceed with the 'No Development' alternative would also result in the loss of opportunity to extract gas for the generation of energy which would have both national and regional social and economic consequences and be contrary to National Energy and Planning Guidance including the 2007 Energy White Paper (Ref. 5.2) and the Energy Act 2008 (Ref. 5.3) which supports additional gas infrastructure in the UK. These adverse socio-economics effects outweigh any potential beneficial effects that would arise from the 'No Development' alternative. Therefore, the 'No Development' alternative was not considered to be a suitable alternative.

2. Alternative Locations for the Well Site

5.7 The precedent for using Ebberston Moor 'A' Well Site has already been established with the well site having been in operation with drilling in 2006 of the Ebberston Moor – 1 well and an additional well cellar. Drilling is scheduled to recommence in 2013 to drill a sidetrack to Ebberston Moor – 1 well and two gas appraisal wells in accordance with planning permission NYM/2013/0068/FL. Furthermore an application for Ebberston Moor Early Development Scheme (Ebberston Moor EDS) has just been submitted (NYM/2013/0477/EIA) to enable development of the well site with the aim of exploiting conventional hydrocarbon resources only, for an operational period of up to five years as part of Phase One of the development of the Ebberston Moor gas field. The Ebberston Moor EDS, if granted planning permission aims to enable medium term production performance of the Ebberston Moor gas reservoir to be assessed, with the aim of proving reservoir volumes sufficient to support investment in future field development.

5.8 Alternative locations for the well site were considered as part of the original planning permission for the drilling of an exploratory borehole at Ebberston Moor (Application Number NYM/2005/0254/FL). The assessment of alternative locations considered technical, economic and environmental criteria as described below.

5.9 The following technical criteria would be considered in the determination of the suitability of a site to be used for extracting gas directly from a gas field. The site needs to:

- lie within a drillable distance of the target hydrocarbons;
- be reasonably level, with no significant slope;
- be of a suitable size to accommodate the drilling rig, ancillary services and materials needed to drill the well;
- have suitable access for articulated vehicles; and
- ideally be located at least 400m from the nearest residential property to ensure noise is mitigated.

5.10 It is not unusual for boreholes to be directionally drilled to enable the target accumulations to be accessed from wells that cannot be sited above the target reservoirs. The Ebberston Moor - 1 existing well, which penetrates the gas reservoir to the north-east of the Ebberston Moor 'A' Well Site was directionally drilled to access an accumulation of gas within Ebberston Moor gas field. However, there are limits on the lateral distances that can be achieved which are largely dependent on the characteristics of the geological formations that the well is drilled through.

5.11 As the wellbore length increases, so do the technical challenges along with the associated risk and cost. Drilling in the North York Moors National Park is more difficult than in many areas due to faulting and associated extensively fractured rocks characterising the geology of the area.

5.12 In addition site selection is constrained by the Applicant's Production Licence Area (PL077) boundary, which runs along an east-west orientation. The vast majority of the PL077 lies within the North York Moors National Park. A very small part of the Licence Area lies just to the south of the North York Moors Park boundary, north of Sawdon Heights. However, this is not suitable for a well site because:

- it is more than 4 km from the target area;
- much of the area outside the North York Moors National Park falls within 400m of a residential property; and
- the area is devoid of any screening and the well site is likely to be highly visible from the surrounding area.

5.13 A study area with a 1 km radius from the existing Ebberston Moor 'A' Well Site was considered for investigating the potential for alternative well sites, as a well site within this area would potentially target the discovered gas accumulation within Ebberston Moor Gas Field with a reasonable chance of success. However there were no suitable alternative sites in evidence and any alternative site within a 1 km radius would still fall within the North York

Moors National Park boundary.

5.14 Environmental considerations including visual impact, proximity to sites of archaeological importance and ecological constraints have also been taken in identifying the location of the Proposed Development. Ebberston Moor 'A' Well Site sits on level ground at the top of a plateau in a remote location in the North York Moors National Park which is well screened. Mature coniferous forest surrounds the Assessment Site to the west, south and north; to the east screening is provided by a narrow strip of vegetation and soil bunds that were installed prior to previous drilling and testing on the well site.

3. Alternative Methods of Treating Gas

5.15 The following alternative methods of treating the gas produced on the Ebberston Moor 'A' Well Site have been considered:

- **Pipe and use natural gas as fuel at Knapton Generating Station (KGS)**: Pipe the untreated natural gas and condensate from the Ebberston Moor 'A' Well Site to KGS where the gas and condensate would be separated and the gas would be used as fuel in the gas turbine to produce electrical energy;
- **Condition the natural gas at KGS and pipe gas to NTS**: Pipe the untreated natural gas and condensate from the Ebberston Moor 'A' Well Site to KGS and then condition the gas within a new gas processing facility at KGS. The processed gas would then be piped to the NTS via a new AGI;
- **Condition the natural gas within Lockton Compound and transfer to existing pipelines with offsite processing of the treatment fluid**: Condition the natural gas within the Lockton Compound adjacent to Ebberston Moor 'A' Well Site and pipe the processed gas through the existing LTZ pipeline via the existing above ground pipeline connection within the NGN AGI operated by Northern Gas Networks (NGN). The gas would then be distributed to local customers in the Scarborough and Whitby region of North Yorkshire. The treatment fluids would be transported and processed offsite;
- **Condition the natural gas within Lockton Compound and transfer to existing pipelines with onsite processing of the treatment fluid**: Condition the natural gas within the Lockton Compound adjacent to Ebberston Moor 'A' Well Site and pipe the processed gas through the existing LTZ pipeline via the existing above ground pipeline connection within the AGI operated by Northern Gas Networks (NGN). The gas would then be distributed to local customers in the Scarborough and Whitby region of North Yorkshire. The treatment fluids would be processed onsite; or
- **Generate electricity on the Lockton Compound to be transferred to the National**

Grid: Generate electricity on the Lockton Compound from the extracted gas using small-scale electricity generating facility which is likely to require no more than 1.6mmscf/d (0.045 mcm/d), and then transfer the electricity to the National Grid via overhead pylons or underground cables.

5.16 **Table 5.1** provides the advantages and disadvantages of the above options.

Table 5.1: Advantages and Disadvantages of the Options for Utilising the Gas

Option	Advantages	Disadvantages
Pipe and use natural gas as fuel at KGS	• Ebberston Moor 'A' Well Site is already developed although not currently in production. • Existing infrastructure already exist at KGS for using natural gas.	• Approximately 15 km of pipeline will need to be laid on previously undeveloped ground to connect Ebberston Moor 'A' Well Site with KGS which would have potential adverse environmental effects associated with disturbing undeveloped ground and crossing ditches.
Condition the gas at KGS and pipe gas to NTS	• Ebberston Moor 'A' Well Site is already developed although not currently in production. • Existing infrastructure already exist at KGS which means the introduction of a new gas processing facility will be in the context of the current facilities.	• Approximately 15 km of pipeline will need to be laid on previously undeveloped ground to connect Ebberston Moor 'A' Well Site with KGS with a further 4.5 km pipeline to connect to the NTS via an AGI which would have potential adverse environmental effects associated with disturbing undeveloped ground and crossing ditches. • Construction and operation of a new gas processing facility would be required on land adjacent to KGS currently used for arable farming which would have potential adverse environmental effects associated with the change in land use.
Condition the natural gas within Lockton Compound and transfer to existing pipelines with offsite processing of the treatment fluid	• Ebberston Moor 'A' Well Site is already developed although not currently in production. • The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently partially vacant and already fenced. • Only a short length of pipeline would be required between Ebberston Moor 'A' Well Site and Lockton Compound. • The proposal would be temporary, pending a viable permanent solution to treat the produced gas outside the National Park. • The existing site is well screened by existing trees or bunding. • There would be early and sustainable gas production at the Ebberston Moor 'A' Well Site using existing local infrastructure already	• The Lockton Compound will need to be extended to accommodate a gas conditioning facility and flare equipment. • There is potential for landscape effects although these can be mitigated. • The whole project would be located within the North York Moors National Park. • Condensate and treatment fluids would be transported off the Assessment Site by tankers increasing the vehicle movements along Ebberston Common Lane. • The proposal is not a permanent or long term solution.

Option	Advantages	Disadvantages
	in place. • There would be no requirement for early investment in, and the environmental effect of the construction of a new pipeline for the initial phase of development.	
Condition the natural gas within Lockton Compound and transfer to existing pipelines with onsite processing of the treatment fluid	• Ebberston Moor 'A' Well Site is already developed although not currently in production. • The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently partially vacant. • Only a short length of pipeline would be required between Ebberston Moor 'A' Well Site and Lockton Compound. • The proposal would be temporary, pending a viable permanent solution to treat the produced gas outside the National Park. • The existing site is well screened by existing trees or bunding. • There would be early and sustainable gas production at the Ebberston Moor 'A' Well Site using existing local infrastructure already in place. • There would be no requirement for early investment in, and the environmental effect of the construction of a new pipeline for the initial phase of development. • Treatment fluids would be treated onsite and would not need to be transferred off site by tankers.	• The Lockton Compound would need to be extended to accommodate a gas conditioning and processing facility and flare equipment. • There is potential for landscape effects although these can be mitigated. • The whole project would be located within the North York Moors National Park. • Condensate and processing waste products would be transported off the Assessment Site by tankers requiring vehicle movements along Ebberston Common Lane. • The proposal is not a permanent or long term solution. • Additional emissions to air within the North York Moors National Park from processing the treatment fluids onsite.
Generate electricity on the Lockton Compound Site to be transferred to National Grid.	• Ebberston Moor 'A' Well Site is already developed although not currently in production. • The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently vacant and already fenced. • There would be early and sustainable electricity production at the Ebberston Moor 'A' Well Site. • Only short lengths of pipeline would be required which would minimise environmental effects relating to constructing pipelines. • Condensate would be re-injected via a new borehole on the well Site rather than being piped to KGS.	• A temporary electricity generating plant would be an unsuitable and inefficient option to exploit a gas field which has the potential to supply considerably more gas than could be used by the electricity generating plant. • The infrastructure would need to be reinforced to export electricity. • Small-scale electricity generation could potentially generate noise from the generator units on site and create an increase in nitrogen oxide emissions within the North York Moors National Park. • There would be a requirement for new high voltage overhead power-line within the North York Moors National Park in the form of either a pylon or a buried cable to transfer the electricity to the National Grid.

5.17 The preferred option for the initial phase of treating the gas extracted from Ebberston Moor gas field, while the medium term production performance of the Ebberston Moor gas

reservoir is assessed, would be to condition the natural gas within the Lockton Compound and transfer the conditioned gas to the existing NGN LTZ pipeline system as per the Ebberston Moor EDS Scheme (for which planning permission is currently being sought). Once the gas production from Ebberston Moor 'A' Well Site has been deemed viable for a longer term solution (Phase 2) the preferred option would be to use natural gas as fuel at KGS as per this planning application.

4. Alternative Pipeline routes

5.18 A number of potential pipeline routes have been explored between Ebberston Moor 'A' Well Site and KGS. Three route option corridors were selected based on industry standard pipeline route design definition criteria, and a site reconnaissance survey carried out on each route option during June 2012. The overall corridor for the route options is restricted due to the proximity along the A170 of local communities, such as Thornton-le-Dale in the west, Allerston and Ebberston in the central corridor and Snainton to the east. These existing constraints and the possibility of further development expansion limit the viable options to the three main route options. The routes considered are described in **Table 5.2** below.

Table 5.2: Advantages and Disadvantages of the Alternative Pipeline Routes

Route Options	Advantages	Disadvantages
Western Alignment	• If a new conditioned gas pipeline to the NTS from a treatment plant at the KGS is to be implemented, this option would permit the incorporation of the pipeline in a shared easement for a distance of about 4km.	• This route option is dictated by the northern section which essentially follows the route of the existing LTZ 450mm diameter gas distribution pipeline through Ebberston Low Moor Forest. The route would potential cross sensitive environmental resources and receptors such as archaeology and has the potential to have adverse environmental effects. However small diameter pipelines laid in the existing corridor should be possible. • The route option would potentially adversely affect forestry activities.
Central Alignment	• This route option avoids conflict with forestry elements. • If a new sweet gas pipeline to the NTS from a treatment plant at the KGS is to be implemented, this option would permit the incorporation of the pipeline in a shared easement for a distance of about 4km.	• This route option crosses an area of archaeological features in the northern section. • In the south it is similar to and runs parallel to the Western Alignment, across environmental sensitive features such as the River Derwent flood plain, which possibly offers habitat to invertebrates
Eastern Alignment	• This route option avoids conflict with forestry elements. • In the south it takes a different route to the previous options and limits the crossing of the River Derwent flood plain to a minimum.	• This route option crosses an archaeological feature in the northern section.

5.19 The Western Alignment has formed the basis for this Planning Application. It avoids crossing ponds with potential for great crested newts although it would cross a Scheduled Monument close to Givendale Head Farm. The effects of crossing the Scheduled Monument (albeit beneath it) will require mitigation in order to avoid an adverse effect on the national significant receptor (see Chapter 13). In addition landowner agreement has been granted for the Western Alignment to allowing the pipeline to cross through their land. However the construction activities associated with the pipeline will potential affect forestry activities which will be minimised through appropriate mitigation measures.

5.20 The option of the constructing the NTS pipeline within the same working corridor as the main pipeline will be pursued at a later date as part of another planning application and has not been considered further in this ES.

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5. Alternative Designs and Design Evolution

5.21 The constraints on the Assessment Site including hedgerows, trees, drainage and topography, have informed the design of the Proposed Development. The considerations and constraints within the Assessment Site which have influenced the design evolution of the Proposed Development are set out in detail in **Table 5.3**.

Table 5.3: Key Considerations and Constraints

Category	Sensitive Receptor/Land Use
Residential/Buildings	• Settlements including: - Scamridge; - Allerston; - Yedingham; - Wilton and - Knapton. • Individual properties including; - South Moor Farm; - Jingleby Thorn; - Ebberston Common House; - High Scamridge; - Givendale Head Farm; - Warren House Farm; - The Elms; - Low Farm; - Newstead Grange; - Wath House Farm; - Elm Tree Farm; - Grange Farm; and - Cliff Edge Farm.
Ecological Features	• Troutsdale and Rosekirk Dale Fens SSSI; • Nabgate SSSI; • River Derwent SAC and SSSI; • North York Moors SSSI, SAC and SPA; • Eller's Wood and Sand Dale SAC and SSSI; and • Flora and fauna within the Assessment Site and its vicinity.

Category	Sensitive Receptor/Land Use
Cultural Heritage	• Scheduled Monuments; • Listed Buildings; and • Archaeology.
Landscape and Views	• North York Moors National Park; • Wolds and Fringe of Moors Areas of High Landscape Value; • Dalby Forest; • Trees and hedgerows within and surrounding the Assessment Site; and • Views towards the Assessment Site.
Water Resources	• Ditches, drains, streams and the River Derwent within the Assessment Site; • Corallian aquifer;
Transport Infrastructure	• Vehicles, pedestrians and cyclists using local highway infrastructure including: - Ebberston Common Lane; - Ebberston Lane; - A170; - Wilton Ings Lane; - Marishes Lane; - B1258 Malton Road; - Unmarked roads; - Dalby Forest Drive; - Tabular Hills Walk; and - Public Rights of Way.
Noise	• Ebberston Common Farm; • South Moor Farm; and • Jingleby Thorn.
Air Quality	• Bridestones; • High Farm; • South Moor Farm; • Bickley Gate Farm; • Troutsdale Lodge; • Ebberston Common House; • Manor House; • Broad Head Farm; • Hern Head House; • High Scamridge Farm; • Stoneclose Campsite; and • Jingleby Thorn.

Summary

5.22 The preferred option for this planning application, as it will form the second phase of the development of Ebberston Moor Gas Field, is to transfer the extracted gas via a pipeline to KGS where the natural gas will be used as fuel-gas to produce energy. This option would minimise the long term environmental effects as much of the infrastructure required at both the well site and KGS would already be in place especially if this development follows on from the Ebberston Moor EDS development which would involve conditioning the natural gas within Lockton Compound and transferring it to existing pipelines within the vicinity.

5.23 The preferred option would provide beneficial socio-economic effects resulting from the

opportunity for the Applicant to exploit on-shore gas in a timely manner while creating and securing existing jobs during construction, operational and decommissioning and restoration phases in an area where there are limited job opportunities. The socio-economic benefits arising from the Proposed Development are considered to significantly outweigh the short-term temporary adverse effects arising from the activities from the construction of the well site and pipeline.