4.0 PROJECT DESCRIPTION

4.1 Moorland Energy is proposing to develop two pipelines from the existing Ebberston Wellsite to the proposed Gas Processing Facility at Hurrell Lane, Thornton-le-Dale. Once processed, the gas will then be fed into the National Transmission System (NTS) via the AGI and a connection into the existing "Burton Agnes – Pickering No.6 Feeder Pipeline" which lies to the south of New Ings Lane, Thornton-le-Dale. The Proposed Development will allow Moorland Energy to withdraw gas from the proven gas field at the Ebberston Wellsite for delivery into the NTS. An explanation of the process for extracting, separating and processing the natural gas is provided herein and a Process Flow Diagram is provided as **Figure 4.1** for illustration.

4.2 There are five principal elements to the Proposed Development as well as a number of associated works including:

- Gas production from the existing Ebberston Wellsite including;
  - A separator at the existing Ebberston Wellsite to separate any produced liquids from the natural gas;
  - Facilities for storing and injecting small quantities of methanol at the Ebberston Wellsite to prevent hydrate formation;
  - Facilities for storing and injecting small quantities of corrosion inhibitor at the Ebberston Wellsite to prevent corrosion of the pipelines which could be caused by the wet and sour condition of the gas;
- The construction of two underground gas pipelines from the existing Ebberston Wellsite to a new Gas Processing Facility including;
  - Construction of one 300mm and one 100mm pipeline and a fibre optic cable within a 15m-42m construction working width between the existing Ebberston Wellsite and the proposed Gas Processing Facility at Hurrell Lane, Thornton le Dale;
- A new access road between the A170 and the proposed Gas Processing Facility;
- A Gas Processing Facility at Hurrell Lane, Thornton-le-Dale including the following main processes;
  - Inlet separation equipment to ensure any liquids not separated at the Ebberston Wellsite are removed;
  - A sweetening plant to remove the Hydrogen Sulphide from the gas stream;
  - Compressors to increase the pressure of the gas to that of the NTS;

- A Hydrocarbon and Water Dew Point Control Plant to remove residual water, organic sulphur compounds and heavy hydrocarbons in the gas stream Gas analysis and metering facilities to monitor the gas quality prior to export to the NTS and to measure the amount being exported;
- A liquids stabilisation and storage area for produced liquid (condensate and water) stabilisation and storage consisting of a three phase separator, holding vessels, tanks, pumps and heaters;
- Safety facilities such as a High Integrity Pressure Protection System (HIPPS) for primary over-pressure protection, pressure sensing devices and an enclosed ground flare system;
- Fire water storage tanks and pumps;
- An administration building containing the control room, offices, workshop and welfare facilities;
- A switchgear room;
- Parking facilities for staff;
- Construction of a security fence and CCTV facilities around the perimeter of the proposed Hurrell Lane Site;
- Associated infrastructure; and
- Construction of one 300mm export pipeline from Hurrell Lane to the proposed NTS AGI in the field to the south of New Ings Lane, Pickering;

- An Above Ground Installation (AGI) which allows connection into the existing National Transmission System (NTS) pipeline to the south of the Hurrell Lane Gas Processing Facility on land off New Ings Lane.

4.3 The main elements of the Proposed Development and the associated processes are described in more detail below.

The Ebberston Wellsite

4.4 The Ebberston Wellsite is located near Givendale Head Farm, Ebberston and utilises an existing access route used during the exploration and appraisal of the Wellsite in February 2009. The compound measures some 114.5m x 146m and will accommodate buildings and equipment for the separation and transfer of the natural gas and condensates (See Figure 4.1). Equipment and buildings will be located within the confines of the existing Wellsite compound.

4.5 During construction the following elements are proposed:

- Construction compound;
- Laydown area;
- Fabrication shed;
- Workforce facilities – messing, catering and offices;
- Security cabin;
- 16 parking spaces;
- Potable water tank; and
- Power generator.

4.6 The main equipment at the Wellsite will include:

- Wellhead;
- Choke valve;
- Two-phase gas-liquids separator;
- Hydrate inhibitor (methanol) storage and injection package;
- Corrosion and/or scale inhibitor storage and injection package;
- Slam-shut (HIPPS) valves and pipelines tie-in arrangement, incorporating double block and bleed, and pig receiver(s)/launcher(s); and
- Utility Systems.

4.7 Gas will flow from the reservoir and through the choke valve which regulates the flow rate of the gas. A horizontal two-phase wellhead separator will separate the gas and liquids, before transfer via the separate pipelines to the Hurrell Lane Gas Processing Facility. The flowing wellhead pressure will provide the driving force for the liquid (and gas) flow.

4.8 Pig launchers will allow the pipelines to be inspected and/maintained but will not be used during normal operation. Methanol is proposed for hydrate inhibition at the Wellsite, requiring a storage tank and injection pumps. Corrosion inhibitor and/or scale inhibitor may also be required for pipe-line protection.

4.9 Electrical distribution, control, shutdown systems, telecommunications, instrument air and wellhead hydraulic panel will be housed within a local equipment room on the Wellsite (normally unmanned).

4.10 The following utilities/systems will be required at the Wellsite:

- Electrical power will be supplied at 400V by the regional electrical company (REC) via a pole-mounted transformer (to be confirmed during FEED);
- Wellhead hydraulic system/panel;
- Instrument air (for actuated valves and plant utility air);
- Nitrogen cylinders (backup for instrument air); and
- Process area drains/interceptor.

4.11 The proposed rate of extraction of the gas from the reservoir is less than 1.2mmscmd and, therefore, the Proposed Development does not fall within the remit of the Infrastructure Planning Commission (IPC) which deals with developments with extraction rates in excess of 4.5mmscmd.

Gas Pipelines between the Ebberston Wellsite and the Hurrell Lane Gas Facility

4.12 Two pipelines will be laid in the same easement between the Wellsite and the Gas Processing Facility – one for gas and one for produced liquids. The gas will be conveyed to the Gas Processing Facility via a new 300mm diameter pipeline. The liquids separated at the Wellsite will be conveyed to the Gas Processing Facility via a dedicated liquids pipeline of 100mm in diameter.

4.13 During construction of the pipelines a 15m-42m working width will be required to allow for the laying down of pipe work, the movement of construction vehicles and the use of machinery which is required for the construction of the pipelines. The allotted working width will contain the development as it is being constructed and limit environmental and visual impacts. In some locations along the pipeline route, for environmental reasons, it has not been possible to allocate enough land for the 42m width and a lesser width is provided.

4.14 Once construction has been completed, the working width along the route of the pipeline will be reinstated for its former use i.e. predominantly agriculture. Moorland Energy will, however, retain a 7.4m easement during the operational lifetime of the proposed pipeline for maintenance purposes.

4.15 Soils removed for the excavation of the pipeline route will be stored on site for re-use as part of the re-instatement works. Surplus soils will be removed from the site.

The Hurrell Lane Gas Processing Facility

4.16 The proposed Gas Processing Facility will be located in a field at the junction of Hurrell Lane and New Ings Lane. The Gas Processing Facility will sweeten the sour gas so that it can be utilised in the NTS.

4.17 The Gas Processing Facility will require a compound of 322m x 177m which will be landscaped and bounded by a double security fence of 2.85m in height.

4.18 During the construction phase there will be a number of temporary buildings, compounds and equipment required to complete the construction of the Proposed Development as follows:

- Pipeline Contractor and Laydown/Storage Area;
- Construction compound;
- Storage Area;
- Offices;
- Workforce facilities – changing, drying, toilets, showers and first aid;
- Messing and catering;
- Stores – material container area;
- Laydown area;
- Fabrication area;
- Security cabin;
- Power generator;
- Potable water tank;
- Clocking station; and
- 45 parking spaces.

4.19 The principal components for the Hurrell Lane Gas Facility include:

- Gas receipt, incorporating a double block and bleed, and pig receiver/launcher, for both the gas and liquids pipelines;
- Slug-catcher (inlet separator);
- Pressure reduction heater and choke valve;
- Separator coalescer;
- Liquids handling – when liquids begin to be produced from the well, condensate and water separation and storage plant will come into operation;

- Gas sweetening for removal of hydrogen sulphide including handling of sulphur. Preliminary selection is for a redox type process;
- Gas compression;
- Gas dehydration and dew-point control (water and hydrocarbon), including mercaptans removal. Preliminary selection is for a temperature swing adsorption (TSA) system comprising of a silica gel adsorption processes;
- Custody transfer metering, to include analysis, export gas heating and back pressure control if required;
- Outlet double block and bleed and pig receiver/launcher; and
- Utility Systems.

4.20 A purpose built access road from the A170 Wilton Road running in a southerly direction to the proposed Gas Processing Facility will be developed to mitigate against any adverse traffic impacts on the local roads.

4.21 The principal equipment at the Gas Processing Facility includes:

(i) Inlet Separation;
(ii) Gas Sweetening (Hydrogen Sulphide Removal);
(iii) Compression;
(iv) Dehydration, Dew Point Control and Sulphur Compound Removal;
(v) Gas Metering;
(vi) Export Facilities;
(vii) Liquids and Condensate Handling;
(viii) Buildings;
(ix) Utilities; and
(x) Safety Related Equipment.

Inlet Separation

4.22 A pipeline tie-in double block and bleed arrangement and pig receiver/launcher will be required. A pig launcher for the wet gas pipeline will allow the pipelines to be inspected and/maintained but will not be used during normal operation.

4.23 From the pipeline the gas will then pass through an inlet separator, designed to separate liquids from the gas, which will also be designed to handle slugs of liquid from the gas pipeline.

4.24 A pressure reduction heat exchanger will be used to raise the temperature of the incoming gas prior to pressure reduction. A shell and tube exchanger is proposed utilising hot water/low pressure steam as the heating medium.

4.25 Pressure control valves will be used to reduce the pressure of the gas to meet the conditions required at the inlet to the gas sweetening plant (approximately 17 to 40 barg). Two control valves in parallel have initially been allowed for to accommodate the turn down.

4.26 Following pressure reduction the gas will pass through a coalescer separator to remove all liquids from the gas down to fine mist particle size prior to the gas sweetening plant.

Gas Sweetening Plant (Hydrogen Sulphide Removal)

4.27 Gas sweetening involves the removal of hydrogen sulphide (H_2S) from the gas stream. A liquid redox process has been chosen as the preferred process, based on gas flow rate and hydrogen sulphide concentration, for the gas sweetening plant.

4.28 The gas will enter the contactor vessel and will react with a catalyst which removes the H_2S from the gas stream. The sweet gas will exit the package via a separator to remove any liquids from the gas stream.

4.29 The rest of the package focuses on regenerating the catalyst and dealing with the by-product. Solid sulphur will be produced as a by-product from the gas sweetening plant, and will be sold for use by others (e.g. in fertiliser).

4.30 Atmospheric emissions and odours will be minimised; suitable containment or mitigating equipment will be included.

Compression

4.31 Compression is required in order to increase the gas pressure from the outlet of the sweetening plant, to overcome downstream pressure drops, and meet the NTS pressure requirements.

4.32 Based on the process conditions, the initial proposal is for electric driven (variable speed) compressors. The compression ratio required could necessitate two-stage compressors.

4.33 The compressors will be housed in a suitable building to provide the noise attenuation required to meet noise emission levels. Air fin type coolers are proposed for the inter-coolers and after-coolers, and knockout (KO) drums will be provided at the compression suction, discharge and inter-stage.

Dehydration, Dew Point Control and Sulphur Compound Removal

4.34 The gas is to meet National Grid's stringent export specification. In order to achieve this, the residual water, heavy hydrocarbons and sulphur compounds will be removed from the gas stream.

4.35 Inlet coalescer filters have been included to remove any free liquids and reduce any unnecessary load downstream.

4.36 The gas stream passes through two packed bed towers, operating in series, in order to remove any residual sulphur compounds not removed by the gas sweetening process. The chemical within these towers may need to be replaced about once a year.

4.37 The gas stream then passes through a further two adsorber towers which utilise a temperature swing adsorption process incorporating fixed beds of silica gel adsorbants which remove water and heavy hydrocarbons from the gas stream. Two adsorption columns/beds have been allowed for; one in operation, and one in standby/regeneration.

4.38 Regeneration of the adsorber beds utilises high temperature which is heated via a gas fired regeneration heater. The hot gas may be used to pre-heat the heating gas (if applicable) in a gas-gas exchanger, and is then further cooled using an air fin type cooler. The cooled gas passes through a knock out drum where the desorbed liquids are removed, and from where the gas returns to the adsorber inlet manifold. Liquids from the regenerator KO drum will be transferred to the liquids handling and storage system.

Gas Metering

4.39 After the dehydration and dew point control plant the gas passes through backpressure control valves then through the metering package and gas analysers, prior to export.

4.40 The metering package will need to be suitable for custody transfer/fiscal metering and, in combination with the gas analysers, will need to meet the appropriate National Grid requirements.

Export

4.41 After metering, the gas stream will exit the plant via an under ground pipeline and travel to a location close to the main National Grid gas pipeline in the area.

4.42 A facility known as an Above Ground Installation (AGI) will be installed to allow isolation between the National Grid pipeline and the Ryedale export pipeline.

4.43 Most of the equipment (i.e. valves) at this facility will be underground. Two small kiosks for an analyser and electrical/control equipment will be installed in the National Grid compound and a kiosk for electrical/control equipment will be installed in the Moorland Energy Energy compound.

Liquids Handling & Storage

4.44 Two-phase separation will be carried out at the Wellsite and gas and liquids transported to the Hurrell Lane Gas Processing Facility via separate gas and liquid pipelines.

4.45 Produced liquids will be separated into condensate and water streams at the Hurrell Lane Gas Processing Facility in the three-phase separator.

4.46 Condensate will be stabilised using a condensate pre-heater and electric condensate flash heater. Condensate will be pumped to, and stored in, a dedicated storage tank. Condensate will be taken off-site via road tanker (by others) and sold as feedstock for further processing in a refinery.

4.47 Produced water will be transferred from the three-phase separator to either a dedicated storage tank. Produced water from storage will be taken via road tanker for treatment / disposal off-site (by others).

4.48 In order to curtail any continuous gas flows to the ground flare, any gas evolved from the liquids separation, stabilisation and storage plant will be collected in the condensate flash drum, and recycled back to the inlet coalescer, via a flash gas compressor (and after-cooler). It is expected that the flash gas compressor will need to be a multi-stage machine due to the likely high compression ratio.

Buildings

4.49 A control and admin building will be provided to include, but not limited to:

- Control room;
- Admin/offices;
- Messing facilities;
- Toilets/showers;
- Electrical and instrumentation workshop;
- Mechanical workshop; and
- Control and shutdown systems.

4.50 Other buildings on the site will include the compressor building, boiler house and a separate local equipment room to house the switchgear.

4.51 Smaller buildings (or enclosures) will be provided for the off-gas compressor, sulphur handling system (within the H_2S removal plant), export gas analyser(s) and the emergency generator.

Utilities

4.52 The remaining equipment on site are utilities required for the operation of the main process equipment. These include:

- Electrical power will be supplied at 11kV by the REC from a local substation to the south west of Thornton-le-Dale. At the Hurrell Lane Gas Processing Facility voltage will be stepped down via transformers to 6.6kV for the compressor supplies (to be confirmed) and to 400V for process equipment and utilities;
- Ground flare (including knock-out drum and knock out drum pumps) for venting and depressurising requirements;
- Fuel gas (side steam taken from gas export manifold/NTS);
- Boiler (to provide low pressure steam/hot water);
- Instrument air (for actuated valves and plant utility air);
- Nitrogen (for compressor seal buffers and purging requirements);
- Diesel (for standby generator and firewater pump);
- Potable water;
- Fire protection systems;
- Cooling water for gas sweetening plant (plus closed loop cooling water/air fin coolers for compression unit services cooling;
- Surface water drains/interceptor;
- Process area drains/interceptor; and
- Foul water drains/septic tank.

Safety

4.52 The plant will conform to the normal health and safety requirements to reflect industry best practice. The plant will include:

(i) High Integrity Pressure Protection System (HIPPS);
(ii) Emergency Shut Down (ESD);
(iii) Safety Shut Down (SSD); and
(iv) Enclosed Ground Flare.

4.53 In order to assist the assimilation of the Proposed Development into the countryside and assist the screening of view from nearby residential properties, a comprehensive landscaping scheme is proposed for the site. In particular, the scheme utilises the existing dismantled railway embankment and other existing landscaping features as natural screening to mitigate against any adverse visual impacts.

4.54 Lighting of the Hurrell Lane site will be required but this will be restricted to safety lighting as follows:

- Adjacent to roadways, footpaths and vehicle manoeuvring areas for safety reasons.
- 'Comfort' lighting to doorways; and
- Localised lighting on the equipment.

4.55 Floodlighting is not required under normal operations. A full Lighting assessment is included in Chapter 14 of the ES.

Above Ground Installation (AGI)

4.56 The export pipeline from the Gas Processing Facility will be connected to the "Pickering to Burton Agnes No.6 Feeder" which forms part of the NTS. At the point of connection there will be two adjacent compounds belonging to Moorland Energy and National Grid respectively and these are referred to as the Above Ground Installation's (AGI's). The connection will be made using a 'hot tap' process which is a physical/mechanical process used to connect the gas pipeline from the Gas Processing Facility into a live (process active) pipeline. The connection is made underground and all piping and valves will be underground. Some ancillary infrastructure, e.g. kiosks for control equipment, valve actuators and fencing will be above ground.

4.57 **Moorland Energy AGI:** This compound will contain a buried actuated valve, used by Moorland Energy to isolate the Gas Processing Facility from the NTS. The principal components for the compound include:

- Electrical and instrumentation kiosk, containing all electrical, instrumentation and telecommunications equipment associated with Moorland Energys equipment at the AGI;
- Actuated isolation valve(s), situated below ground, with operators above ground;
- Bypass valve;
- Pressurisation bridle; and
- Drainage interceptor pit.

4.58 The AGI is sited in a compound surrounded by a 2.8m fence.

4.59 **National Grid AGI:** This compound will contain the buried actuated valve used by National Grid to isolate the NTS from the Gas Processing Facility. It will also contain the buried sample points mounted on the NTS pipe line, upstream and down stream of the connection. The principal components for the compound include:

- Electrical and instrumentation kiosk, containing all electrical, instrumentation and telecommunications equipment associated the MEL equipment at the AGI;
- Analyser kiosk, housing all gas quality analysing equipment;
- Remote operated valve controlled by NG;
- Minimum offtake connection hot tap valve, located below ground;
- Gas sample points (2 off connections to be made to existing Pickering to Burton Agnes No. 6 Feeder, below ground) for analysis of gas composition in feeder in vicinity of minimum offtake connection;
- Bypass valve; and
- Pressurisation bridle.

Process By-Products

4.60 The following by-products are expected as part of the gas production process:

- Elemental sulphur will be produced as part of the gas sweetening process and stored in a sealed area. It is expected that this will transported by truck to be sold as fertiliser;

- Gas condensate will be collected in a storage tank and will be sold for further refining;
- Produced water will be collected in a storage tank to be disposed of by a third-party specialist using road tankers;
- Any chemical catalysts/adsorbents required for the process, may need to be changed out (on a very intermittent basis) and replaced by a third-party specialist.

Waste

4.61 The following sources of waste are expected as part of the operation of the Gas Processing Facility:

- Used oil (including oily rags) for machinery lubrication purposes will be collected, stored in barrels and disposed of by a third-party specialist;
- General office / operational rubbish and food waste will be collected in a skip for disposal into land-fill;
- Recyclable material will be collected in a skip for disposal to recycle facility; and
- Waste fluid caught in the process area and surface water interceptor pits will be collected by vacuum truck and disposed of by third-party specialist.

Hours of Working

4.62 The hours of working for construction are set out in **Table 4.1** and are to be agreed with the Planning Authority. We are proposing that construction work be undertaken between the hours of 7.00 - 19.00 seven days a week to make efficient use of time and the longer, summer daylight hours. By working longer hours over seven days a week, the construction period can be completed over a shorter period therefore reducing disturbance.

Table 4.1: Hours of Working for Construction

Day	Start time	End time
Monday-Friday	07.00	19.00
Saturday	07.00	19.00
Sunday	07.00	19.00

4.63 Variations to the normal working hours may be required for certain construction activities, such as the delivery of abnormal loads, special lifting operations and other works with conditions to be agreed with the Planning Authority.

4.64 During and following commissioning, the Ryedale Gas Project will operate continuously (i.e. 24 hours per day, seven days a week) except for planned shutdowns. Deliveries and the export of materials during operation will, however, be restricted to daytime with no night time deliveries or deliveries on Sundays and Bank Holidays except in an emergency. **Table 4.2** shows the proposed hours of delivery.

Table 4.2: Hours of Deliveries

Day	First Delivery	Last Delivery
Monday-Friday	07.00	18.00
Saturday	07.00	13.30
Sunday	None	None

4.65 Further details of the proposed construction programme are set out in Chapter 6 of the Environmental Statement.