

15.0 GROUND CONDITIONS AND CONTAMINATION

Introduction

- 15.1 This chapter of the ES assesses the likely significant effects of the Proposed Development on the existing geology (including overlying soils) and ground conditions relating to ground instability and contamination and is supported by **Appendices 15.1** and **15.2**.
- 15.2 The chapter describes: the assessment methodology; the baseline conditions currently existing at the Assessment Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. This chapter has been prepared by URS.

Planning Policy Context

- 15.3 This section presents the national legislation, national planning policy, regional planning policy and local planning policy that is relevant to the geology and ground conditions assessment relating to the Proposed Development.

National Planning Policy

National Planning Policy Framework (NPPF), March 2012 (Ref. 15.1).

- 15.4 The National Planning Policy Framework was published by the Government in March 2012 (Ref. 15.1), with the purpose of providing simple and clear guidance to the Local Planning Authorities to help achieve sustainable development when considering planning applications affecting protected habitats, sites and species. Circular 06/2005 (Ref. 15.3), which provides further guidance on the statutory obligations for Biodiversity and Geological Conservation and their impact within the planning system has been retained for information.
- 15.5 With regard to geodiversity, the NPPF includes the following:

“The planning system should contribute to and enhance the natural and local environment by:

- ***Protecting and enhancing valued landscapes, geological conservation interests and soils;***” (Section 11, item 109)

“Distinction should be made between the hierarchy of international, national and locally designated sites (citing circular

06/2005- Ref.15.3) ***so that protection is commensurate with their status, and gives appropriate weight to their importance and the contribution that they make to wider ecological networks.***
(Section 11, item 113)

“To minimise impact on biodiversity and geodiversity, planning policies should:

- ***Aim to prevent harm to geological conservation interests.***
(Section 11, item 117)

National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4), July 2011 (Ref. 15.4).

- 15.6 The National Policy Statement (NPS) for Gas Supply Infrastructure and Gas & Oil Pipelines was published in July 2011 (Ref. 15.4). Paragraph 1.2.1 states that the NPS, together with the ‘Overarching Policy Statement for Energy’ (EN-1), provides the basis for decisions by the IPC [now the SoS for Energy and Climate Change] on applications for gas supply and infrastructure and gas and oil pipelines. Paragraph 1.2.3 goes on to say that the NPS is likely to be a material consideration in decision making on relevant applications that fall under the Town and Country Planning Act 1990. Whether and to what extent the NPS is a material consideration will be judged on a case by case basis.
- 15.7 The NPS states that pipelines may be installed in a variety of geological conditions and therefore it is important to understand the soil types and the nature of the underlying strata. This is because underground cavities in the ground such as caves or mines and unstable ground conditions such as running sands or landslide areas could pose risks to pipeline projects. Impacts could include sterilisation of mineral resources or loss of soil quality. The National Policy further states that:

“Applicants should assess the stability of the ground conditions associated with the pipeline route and incorporate the findings of that assessment in the ES.....”

“.....When considering any application where the pipeline goes under a designated area of geological or geomorphological interest, the applicant should submit details of alternative routes, which either bypass the designated area or reduce the length of pipeline through the designated area to the minimum possible, and the reasons why they were discounted.”

- 15.8 Construction activities also have the potential to cause pollution due to waste management activities resulting in contamination of the land, groundwater or surface water. Under the Environmental Protection Act 1990 (Ref. 15.5), the Environment Agency is responsible for prevention of pollution of the environment, harm to human health and detriment to local amenity. The Environment Agency has produced guidance for the management of

environmental impact of construction activities (Ref. 15.6) which is also considered pertinent to the Proposed Development.

Local Planning Policy

North York Moors National Park Authority Core Strategy and Development Policies (2008) (Ref. 15.7)

15.9 The North York Moors National Park Authority has published planning advice in respect of developments potentially affecting geological receptors. This document includes a number of references in terms of geological conservation, ground stability and avoidance of adverse impact on soil. These policies provide the framework for more specific actions required for the determination of planning applications and are summarised as follows:

- **Core Policy C** – Natural Environment, Biodiversity and Geodiversity. The policy recognises the importance of Regionally Important Geological / Geomorphological Sites (RIGS), which are identified as worthy of protection for their educational, scientific, historical or landscape importance. The policy takes forward the following spatial objectives in terms of management of the natural environment:

"Conserve and enhance the natural environment and biological and geological diversity of the Park". The policy expresses that all developments, projects and activities will be expected to: *"...Maintain and where appropriate enhance recognised geodiversity assets"* and *"Maintain and where appropriate enhance other sites, features, species or networks of ecological or geological interest and provide for appropriate management of these"*.

- **Development Policy 1** – Environmental Protection. The policy refers specifically to issues of ground instability and especially to peripheral areas comprising of steep slopes and cliffs affected by landslip, historical mine workings, coastal erosion or compression of soft upland peat. It states that ground stability can be a material consideration in determining a planning application. It also states that detailed information is not available on where instable land exists in the Park, but in some cases the authority may request the applicant to demonstrate that land is stable or that any instability can be overcome. These objectives are listed in Items 1 and 4:

"To conserve and enhance the special qualities of the North York Moors National park, development will only be permitted where: [1] It will not have an unacceptable adverse impact on surface and ground water, soil, air quality and agricultural

land.", and "[4] Land stability can be achieved without causing unacceptable environmental or landscape impact."

Discussion

- 15.10 The planning policy review has identified those national and local policies relating to ground conditions, contamination and geological conservation. These require that the potential effects of ground instability and the possible adverse implications arising from the Proposed Development should be considered in planning decisions.
- 15.11 Under the local development framework (Ref. 15.7), Core Policy C and Development Policy 1 states that a development will only be permitted where it will not have an unacceptable adverse impact and can be achieved without causing unacceptable environmental or landscape impact. It also requires that developments will maintain and where appropriate enhance recognised geodiversity assets and other site features including geological interest and provide for appropriate management of these. The core strategy highlights the responsibilities of the planning process and as such the responsibility rests with the developer to determine the nature of the ground conditions and demonstrate that the Proposed Development will not adversely impact the environment and landscape in terms of instability and ground contamination and appropriate ground management strategy for the whole life of the Proposed Development.

Assessment Methodology

Assessment Methodology and Sources of Information

- 15.12 The assessment of ground conditions has involved collation and review of available information pertaining to the current condition of soil and bedrock on the Assessment Site centred on the Ebberston Moor 'A' Well Site and Lockton Compound and extending up to 1 km beyond the centre of the Assessment Site. This information provides the basis for characterisation of the baseline conditions at the Assessment Site. The information has been reviewed in context of the Proposed Development and used to evaluate direct and indirect impacts posed in the short-, medium- and long-terms.
- 15.13 The following data was reviewed as part of the assessment:
- Landmark Envirocheck[®] Report (see **Appendix 15.2**);
 - www.magic.gov.uk – interactive online geographic information on land classification (Ref. 15.8);

- North York Moors National Park Authority – Local Development Framework – Proposals Map (Ref. 15.9);
- British Geological Survey (BGS) solid and drift geology maps (Ref. 15.9 & 15.10);
- The geological memoir of the country between Whitby and Scarborough (Ref. 15.11);
- Current Ordnance Survey Mapping (Ref. 15.12).

Significance Criteria

- 15.14 A qualitative assessment of potential impacts has been carried out using the significance criteria described in Chapter 2 of the ES and summarised in **Table 15.1**. The assessment, where possible identifies, describes and assesses the likely significant effects of the Proposed Development on the environment.
- 15.15 The general principles for the EIA procedure are described in DETR Circular 02/99 (Ref 15.13). The guidance is generic in its nature and therefore procedures have been developed for specific subject areas and the procedure adopted for the assessment of ground conditions is discussed below.
- 15.16 The process of EIA sets out to determine the significance of an effect to a receptor, which may include land, water or persons. Determination of the significance is based on a relationship between sensitivity (importance or value of affected receptor) and magnitude or severity of an effect (actual change taking place).
- 15.17 The determination of significance also includes considerations of the type of effect (beneficial or adverse); the extent and magnitude of the effect; the duration of the effect (short, medium, long-term, temporary or permanent); and, the nature of the effect (direct, indirect, reversible or irreversible).
- 15.18 The definitions of pre-mitigation and residual impact significance specific to Ground Conditions and Contamination take into account the large body of technical literature and guidance that has been produced in the UK for the assessment of ground conditions by the Government (Department of Environment, Food and Rural Affairs – DEFRA), and predecessor Departments and agencies such as the Environment Agency. The following documents are considered relevant to the assessment:
- DTLR Development on land affected by contamination – Consultation paper on draft planning technical advice (Ref. 15.14);
 - Part 2A of the Environment Protection Act, DEFRA Circular 01/2006 (Ref. 15.5);

- Environment Agency Remedial Targets Methodology (Ref. 15.15); and
- Contaminated Land Research (CLR) Reports 7 to 13 (Refs. 15.16 to 15.18).

15.19 The guidance provides for staged and risk-based data interpretation. The preliminary assessment is undertaken according to the criteria set out for a generic risk assessment. Based on the outcome of the initial review it may be required to proceed through to a more onerous development of site specific criteria, determined by calculation. The former are set as a boundary limit, which when not exceeded, ensure the unlikelihood that relevant receptors will be exposed to significant levels of risk. But when these limits are exceeded, it becomes appropriate to undertake further assessment, which may include for additional data collection and site-specific risk assessment to determine the need for further action.

15.20 The CLA reports (No's 7 to 13) (Ref. 15.16 to 15.18) set out the process required to calculate specific soil guideline values (SGV), including the Contaminated Land Exposure Assessment (CLEA) model, in order to safeguard human health.

Table 15.1: Assessment Significance Matrix

Sensitivity of Receptor	Magnitude of Effect		
	High	Medium	Low
High (England / UK)	Major	Major / Moderate	Moderate
Medium (County / Regional)	Major / Moderate	Moderate	Moderate / Minor
Low (Local / District)	Moderate	Moderate / Minor	Minor

15.21 The assessment of the significance of the Proposed Development on the geology and ground conditions is made by comparing the existing geology and ground conditions to the likely conditions post development. The definition of low, medium and high magnitude of effect is subjective for impacts to both ground conditions and geology. However, comment is made in the context of the guidance and legislation described above as follows:

- **High:** In terms of ground conditions, a major impact would be defined as a potential significant impact identified for a specific receptor i.e. construction worker - potential loss of human life / serious injury or illness;
- **Medium:** In terms of ground conditions, a moderate impact would be defined as a consequence that could result in land contamination as defined under Part 2A of the Environmental Protection Act, 1990 (Ref. 15.5); and
- **Low:** In the case of ground conditions, a minor impact would be defined as disruption to construction, demolition or operation of the facility.

15.22 Based on the sensitivity of the receptor and magnitude of the effect, three levels of significance are defined as:

- **Major:** an effect which in isolation would have a material influence on the decision making process;
- **Moderate:** an effect which on its own could have a moderate influence on decision making, particularly when combined with other similar effects; and
- **Minor:** an effect which on its own is likely to have a minor influence on decision making but when combined with other effects could have a more material influence.

15.23 Where an effect is considered to be not significant or have no influence, irrespective of other effects, then it is classified as 'negligible'.

15.24 Where appropriate, the effects may also be described as:

- **Adverse:** presenting detrimental or negative effects to an environmental resource or receptor; or
- **Beneficial:** of beneficial or positive effect to an environmental resource or receptor.

Baseline Conditions

Site Inspection

15.25 The Assessment Site is located on Eberston Low Moor situated in the Dalby Forest in the southern part of the North York Moors National Park known as the Tabular Hills. The Assessment Site comprises the fenced compound of an existing well site (Eberston Moor 'A' Well Site) and part of the adjacent Lockton Compound (**Appendix 15.1**, Photograph 15.1). The Assessment Site is situated in a triangular strip of woodland confined between Dalby Forest Drive located to the west, and Eberston Common Lane. The Assessment Site is surrounded to the north, west and south by mature forestry plantation. The eastern boundary of Eberston Moor 'A' Well Site is defined by a thin strip of land between the adjacent access road (Eberston Common Lane). The strip of land is approximately 5m wide and covered by rough grass, brush and occasional trees. To the east of Eberston Moor 'A' Well Site and Eberston Common Lane, the land comprises hedge and fence lined grazing fields. Approximately 8m immediately north of Eberston Moor 'A' Well Site and separated by a narrow zone of trees is the Lockton Compound which is a second fenced compound containing an operational Above Ground Installation (AGI) owned by Northern Gas Networks (NGN) (**Appendix 15.1**, Photograph 15.2).

- 15.26 The Eberston Moor 'A' Well Site consists of an area of flat bare ground covered with crushed hardcore placed over a geotextile membrane and bentonite mat connected into a perimeter bentonite mat lined drainage ditch (**Appendix 15.1**, Photograph 15.1b). Soil bunds of between 2m and 4m in height are located between the drainage ditch and perimeter fence along the western and southern perimeter of the well site. The bunds believed to comprise of previously excavated superficial soil and weathered bedrock comprise of light brown and red brown silty fine to medium sand with much angular tabular fine to coarse gravel and cobbles of fine grained calcareous Sandstone, locally mixed with grey silty topsoil (**Appendix 15.1**, Photograph 15.1b). The surface of the bunds tends to be vegetated with coarse grass and brush.
- 15.27 The adjacent Lockton Compound consists of an area of flat bare ground covered with crushed hardcore bound by a mesh and concrete post perimeter fencing of approximately 2m height capped with barbed wire. Along the eastern section of the compound are located a small area of concrete hardstand, a section of above ground pipework and a small concrete building (**Appendix 15.1**, Photograph 15.2).

Geology

- 15.28 The geology of the Assessment Site comprises of Corallian Group strata of Upper Jurassic age as indicated on the 1:50,000 scale geological maps and memoir (Ref. 15.9 to 15.11). The generalised geology plan for the Assessment Site and immediate surrounding area is shown on **Figure 15.1** and **Figure 15.2** and summarised in **Table 15.2**.

Table 15.2: Summary of Geological Strata and Related Potential Geological Hazards

Group	Formation	Key Members	Description	Associated Natural Geotechnical Hazards
Corallian Group	Coralline Oolite Formation	Middle Calcareous Grit Member (MCG)	Calcareous fine sandstone, with beds of sandy and oolitic limestone. Attains maximum thickness of between 12-15m in Tabular Hills.	Ground Dissolution Voids
		Hambleton Oolite Member (HaO)	Thin bedded sandy or muddy ooidal limestone. Attains maximum thickness of between 20-35m in Tabular Hills.	Ground Dissolution Voids

- 15.29 Site examination comprising of shallow hand excavation, inspection of forest and farm excavations and reference to archival borehole data indicates that the soils comprise of brown sandy clayey silt, with some subangular and subrounded gravel of brown fine to

medium calcareous sandstone and micritic limestone. The soils cover tends to be shallow with weathered rock occurring typically at depths of 0.3 to 0.8m depth and locally to depths of 1.5m in the boring adjacent to the nearby Ebberston Common Farm.

- 15.30 The gas reserve of the Ebberston Moor gas field have originated from Carboniferous (Westphalian) Coal Measures strata and became trapped in overlying fractured Permian limestone, dolostone and basal sandstone strata particularly the porous Permian Kirkham Abbey Formation (KAF). The gas reservoir is located approximately 1200 and 1500m below ground level and is overlain by younger strata of Triassic and Jurassic age comprising significant thicknesses of mudstones, sandstones and limestone units. Above the mudstones, sandstones and limestone units are the younger Corralian Group bedrock strata of Upper Jurassic age which are encountered at outcrop and shallow subcrop in and around the Assessment Site. It is therefore highly unlikely for any continuity to exist between the surface bedrock and deeper reservoir rock and therefore there should not be any issues in relation to the Proposed Development. Therefore it is the Corralian Group bedrock strata which are significant to the infrastructure development at ground surface and considered further in relation to the Proposed Development.

Running Sand

- 15.31 The Envirocheck report (**Appendix 15.2**) indicates that there is 'No Hazard' potential from running sand at or immediately adjacent to the Assessment Site, and therefore should not pose a ground issue in relation to the Proposed Development.

Landslides

- 15.32 The Envirocheck report (**Appendix 15.2**) indicates that there is 'No Hazard' potential from natural landslides at or immediately adjacent to the Assessment Site. It should be noted that this does not include the potential for artificially induced landslides or ground slips caused as a result of construction at the Assessment Site, which shall be dealt with later in this Chapter.

Ground dissolution

- 15.33 The dissolution of calcareous rocks occurs due to the inflow of aggressive carbonated surface water and throughflow of groundwater. Over significant periods of elapsed time, dissolution of the calcareous rock may occur particularly along discontinuities and voids may develop at

discontinuity intersections. The unsupported voids may develop into a network of caves or remain as discrete features but nonetheless pose issues in terms of ground collapse.

- 15.34 The members of the Coralline Oolite Formation are classified as 'Very Low Hazard to No Hazard', and therefore should not pose a ground issue in relation to the Proposed Development.

RIGS

- 15.35 A review of the Envirocheck Data and NYMNP Local Development Framework Proposals Map (Ref. 15.7) indicates that there are currently no Regionally Important Geological / Geomorphological Sites (RIGS) within a 1 km radius of the Assessment Site.

SSSI

- 15.36 A review of Envirocheck Data and NYMNP Local Development Framework Proposals Map (Ref. 15.7) indicates that there are currently no Sites of Special Scientific Interest (SSSI) relating to geological or geomorphological features within a 1 km radius of the Assessment Site. The closest SSSI to the Assessment Site is the Troutdale and Rosekirk Dale Fens SSSI located approximately 1.7 km to the south and is a statutory designated nature conservation site due to its rare spring and flush fen habitat.

Mineral reserves

- 15.37 There are two historic quarries located in the area surrounding the Assessment Site, which are indicated on the Ordnance Survey maps, geological maps, and the Envirocheck reports (see **Appendix 15.2**). A quarry associated with Ebberston Common Farm (referenced Ebberston Moor House) is located in excess of 400m south east of the Assessment Site. The second historical quarry operation comprises of a number of small pits located between 20 and 150m northwest of the Lockton Compound perimeter. The sites are located over the Hambleton Oolite Member of the Coralline Oolite Formation which lies close to the ground surface and will have been easily excavated. It is likely that the operations were probably associated with the winning of local building stone for construction of the houses and farm buildings of the area.

15.38 Given the wide occurrence of the Corraline Oolite Formation and more specifically the Hambleton Oolite Member, it is unlikely that the Proposed Development will result in sterilisation of the potential mineral reserves of building stone.

15.39 The historical quarries were very small operations and are considered to have a negligible contamination potential on the soils of the Assessment Site.

Contamination Potential

15.40 The Envirocheck Report (**Appendix 15.2**) does not have records of any operational or historical landfill site within a 1 km search area around the Assessment Site. Therefore contamination potential is considered to pose 'No Hazard' to the Proposed Development.

Likely Significant Effects

Construction

15.41 Full details of the construction phase of the Proposed Development are presented in Chapter 6. This section considers the effects of the construction and maintenance program without considering any further mitigation measures beyond those incorporated directly into the design of the Proposed Development.

15.42 Likely significant effects from the construction phase include:

- Release of oil and fuel (hydrocarbons) from plant and machinery into the ground;
- Initiation of ground instability due to fragmentation, overbrake and ground collapse in temporary excavations; and
- Collapse of temporary excavations due to presence of completely weathered rock such as residual sand and running sand pockets.

Hydrocarbon contamination

15.43 Point source hydrocarbon pollution resulting from fuel and spent oil spills from machinery during the construction phase has the potential to enter the ground and ultimately the groundwater.

15.44 The escape of hydrocarbons can result in a reduction in quality of local soils which have agricultural and forestry value. Hydrocarbons can bind to soils and have the potential to stay

in the ground for a relatively long period of time. Some compounds could be taken up by plants, which may eventually reach animals and humans through the food chain.

- 15.45 The effect of the hydrocarbon contamination will depend on the quantities lost to the ground. Therefore it is considered that hydrocarbon spill have the potential to cause long-term, high adverse impact to local receptors. Consequently it is assessed as having a moderate adverse significance.

Instigation of landslides and loss of ground support

- 15.46 The excavation for foundations, upgrade of the wells and installation of connecting pipework will be formed in an area of level ground where rock head is anticipated to be present at a shallow depth. At this location the rock mass condition, dip orientation and dip of the bedrock strata is uncertain. Shallow temporary excavations into rock will temporarily remove support for the soil/rock which may develop potential for rotational failure into the excavation if the bedrock structural geometry is unfavourable. This could cause injury to construction personnel and result in damage to adjacent plant and infrastructure, but is unlikely to result in damage to the adjacent access road or agricultural land.
- 15.47 The excavations are likely to be open for periods of a few days to a few weeks. Consequently the effect is likely to be short-term and of high adverse magnitude. Therefore the effects are assessed to be of moderate adverse significance.

Running sands and ground dissolution

- 15.48 The Envirocheck report (**Appendix 15.2**) indicates that the presence of running sands is unlikely. Open excavations may encounter shallow loose sand horizons resulting from the natural weathering of the calcareous sandstone bedrock. Water entry from surface runoff and rainwater may cause localised occurrence of running sand and lead to loss of support to the excavations. Also the presence of elevated or perched groundwater will result in localised collapse.
- 15.49 The Envirocheck report (**Appendix 15.2**) indicates that the members of the Coralline Oolite Formation which are present at the Assessment Site have a very low likelihood of ground dissolution features. Weathering may result in minor dissolution along shallow discontinuities affecting the shear strength along these features. This may produce minor and immediate settlement of structures and minor block fall into the excavations where orientations of the discontinuities dip into the excavation.

15.50 Consequently the effects of both running sands and ground dissolution are considered to be short-term and of low adverse magnitude to local receptors. Therefore the significance of the effect is assessed as minor adverse.

Operation

15.51 The operational phase effects are considered to be as follows:

- Hydrocarbon contamination from minor oil spill from vehicles / machinery and or stored fuel at the Assessment Site;
- Leaks of natural and conditioned gas at the Assessment Site from pipe and connections associated with the processing infrastructure; and
- Minor spills of waste material (sulfur, glycol and amines) during storage and transfer at the Assessment Site, and during transfer away from the Assessment Site by road to appropriate treatment facility.

15.52 There is the potential for minor spills of oil and hydrocarbons at the Proposed Development, from vehicles and fuel storage areas. These are likely to be localised point source pollution which has the potential to enter the ground and ultimately the groundwater. Hydrocarbon pollution from these sources could affect human health through contact by site workers and the linkage described in section 15.43.

15.53 There are the potential minor spills of process waste material including sulfur, glycol and amines during processing, transfer and storage at the Assessment Site and during road transfer off site for processing. The pollution from these sources could affect human health through contact by site workers and similar linkage described for hydrocarbons in section 15.43.

15.54 The contamination is likely to be point source and could affect the groundwater by infiltration and soil in which crops are grown, resulting in a potential risk to human health.

15.55 It is considered that the potential affects will be long-term, of high adverse magnitude to local receptors. Consequently it is assessed as having a moderate adverse significance.

Decommissioning and restoration

- 15.56 Decommissioning and restoration activities associated with the end of the Proposed Development lifespan for both scenarios include the removal of site infrastructure at the Assessment Site.
- 15.57 The main effect is considered to be from hydrocarbon contamination from minor oil spills from vehicles and machinery and stored fuel, as well as potential pollution from natural gas condensate.
- 15.58 The contamination is likely to be point source and could affect soil in which crops are grown, or upon which animals graze, resulting in potential risk to human health.
- 15.59 It is considered that the potential affects will be long-term, high adverse impact to local receptors. Consequently it is assessed as having a moderate adverse significance.

Mitigation Measures

- 15.60 The general mitigation measures that can be employed to reduce the potential effects of the Proposed Development are summarised in **Table 15.3**. The construction and operational mitigation measures will be implemented through the Construction Environmental Management Plan (CEMP).

Table 15.3: Mitigation Measures

Phase	Likely significant effect	Mitigation Measure
Construction	Oil and Hydrocarbon contamination	Installation of drip trays beneath oil tanks / engines / gearboxes / hydraulics where appropriate. Handling of fuel on securely bunded areas. An emergency spillage action plan will be produced for the Assessment site. Spill kits and trained personnel on site.
	Loss of Ground Support due to dissolution, sliding caused by adverse bedrock structure, collapse and running sands	Appropriate geotechnical investigation prior to construction and design of temporary excavation support if required.
Operation	Oil, Hydrocarbon and Process Waste contamination	Installation of drip trays beneath oil tanks / engines / gearboxes / hydraulics where appropriate. Handling of fuel on securely bunded areas. Storage and transfer of process waste securely bunded area installed with interceptors to prevent ground infiltration with petrol interceptors to treat waste process water before discharge to soakaways. An emergency spillage action plan will be produced for the Assessment Site.

Phase	Likely significant effect	Mitigation Measure
		Spill kits and trained personnel on site.
Decommissioning	Oil, Hydrocarbon and Process Waste contamination	Installation of drip trays beneath oil tanks / engines / gearboxes / hydraulics where appropriate. Handling of fuel on securely bunded areas. Transfer of process waste securely bunded area installed with interceptors to prevent ground infiltration. An emergency spillage action plan will be produced for the Assessment Site. Spill kits and trained personnel on site.

Hydrocarbon contamination – Construction, operation and decommissioning

15.61 The effects and mitigation measures for potential contamination of soil and groundwater from hydrocarbon contamination are similar for all three phases of the Proposed Development and summarised below.

15.62 To mitigate the risk of pollutants entering controlled waters, handling and storage of fuels and oils will adhere to Environment Agency guidance: PPG1 (Ref. 15.19), PPG2 (Ref. 15.20), PPG5 (Ref. 15.21), PPG6 (Ref. 15.22), PPG8 (Ref. 15.23), PPG18 (Ref. 15.24) and PPG21 (Ref. 15.25). Various measures are recommended in the above guidance to protect soils and controlled waters from the release of oils and hydrocarbons, which would otherwise have an adverse impact. These measures comprise:

- Oils and hydrocarbons will be stored in designated locations with specific measures to prevent leakage and release of their contents, including locating the storage area away from the surface water drainage system and watercourses on an impermeable base, with an impermeable bund that has no outflow and is of adequate capacity to contain at least 115% of the contents;
- Machinery will be refuelled using a transfer hose and valves. Trigger guns will also be protected from vandalism and kept locked when not in use;
- When not operational, plant and machinery will have drip trays beneath oil tanks/engines/gearboxes/hydraulics that will be checked and emptied regularly via a licensed waste disposal operator; and
- An emergency spillage action plan will be produced, which site staff will have read and understood. On-site provisions will be made to contain a serious spill or leak through the use of spill kits, booms, bunding and absorbent material. Site staff will be trained in the use of emergency spill response equipment.

Loss of Ground Support due to dissolution, sliding, collapse and running sands

- 15.63 The risk of ground collapse of the excavations from running sands and dissolution during construction will be mitigated using the measures summarised below.
- 15.64 Appropriate geotechnical investigation will be undertaken in key areas of the Proposed Development and construction activities. The ground conditions encountered will need to be logged and geotechnical testing of the soils will need to be undertaken:
- Appropriate stability analyses should be undertaken to confirm if there is a risk; and
 - If required, temporary excavation support and temporary dewatering could be designed to prevent collapse of the excavation while it is open.

Residual Effects

- 15.65 The residual effects of the Proposed Development, after the above mitigation measures have been incorporated are discussed below for each of the potential effects.

Hydrocarbon Process Waste contamination– Construction and operational

- 15.66 With the mitigation measures identified above, potential impacts associated with the release of oil and fuel during construction works are likely to be negligible.
- 15.67 Implementation of the above measures does not, however, exclude the possibility of an accidental spillage of oils and fuels during construction, and oils, fuels and process waste during operation, and decommissioning and restoration of the Proposed Development with the impact significance dependent upon the volume lost to ground. Although an emergency spillage plan will be designed and implemented through the construction, operation, decommissioning and restoration programme to minimise the impact of such an event, accidental spillages still have the potential to result in a high, adverse impact, which will be of moderate adverse significance.

Loss of Ground Support due to dissolution, sliding, collapse and running sands

- 15.68 The potential for ground collapse to occur as a result of the excavations during construction, and decommissioning and restoration, or the potential for running sands to cause collapse will be controlled through design following on from an appropriate geotechnical investigation

and ground modelling. Therefore, the residual effects for both of the hazards are considered to be negligible.

Cumulative Effects

- 15.69 The cumulative effects of the Proposed Development has been assessed in relation with other proposed or permitted schemes in the area, which in combination may generate compounded elevated levels of effect above those discussed for the Proposed Development alone. The only other known scheme that has been covered as part of the cumulative effects assessment comprises the Ryedale Gas Project (NY/2010/0159/ENV).
- 15.70 For the purpose of the assessment the Ryedale Gas Project comprises of the existing Ebberston South Well Site, and the pipeline route where the closest structural elements to this Proposed Development are located. The nearest section of the consented Ryedale Gas Project to the Proposed Development comprises the pipeline route in the vicinity of Oxmoor Dike, which is approximately 2.6 km due south of the Proposed Development. Overall, it is assessed that there is no potential for any cumulative effects to arise when considered in combination with the Proposed Development.

Summary

- 15.71 The effect of the Proposed Development on the geology and ground conditions has been assessed through the identification of baseline environmental quality and the potential sources, magnitudes and significance of any impacts. The assessment has been based on professional judgement, data and reviews of relevant literature, policies and legislation.
- 15.72 The baseline ground conditions at the Assessment Site comprise of shallow calcareous sandstone and oolitic limestone bedrock of the Cretaceous Coralline Oolite Formation. The bedrock is overlain by a thin veneer of superficial soil profile consisting of weathered rock and topsoil occurring typically to thicknesses of between 0.3m and 1.5m above rockhead locally to the Assessment Site.
- 15.73 No significant soil and geology impacts are expected to occur throughout the construction, operational and decommissioning and restoration phases, provided that standard mitigation measures are applied as discussed in this chapter. **Table 15.4** contains a summary of the likely significant effects of the Proposed Development.

Table 15.4: Table of Significance – Ground Conditions and Contamination

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)
				I	UK	E	R	C	N P	L	
Construction											
Hydrocarbon contamination	Temporary	Moderate Adverse	Installation of drip trays beneath oil tanks/engines/gearboxes/hydraulics where appropriate. Handling of fuel on securely bunded areas. An emergency spillage action plan will be produced for the site. Spill kits and trained personnel on site.							*	Negligible
Ground collapse during construction	Temporary	Minor Adverse	Appropriate geotechnical investigation prior to development and design of temporary excavation support and temporary dewatering control if required.							*	Negligible
Operation											
Hydrocarbon contamination	Temporary	Moderate Adverse	Installation of drip trays beneath oil tanks/engines/gearboxes/hydraulics where appropriate. Handling of fuel on securely bunded areas. An emergency spillage action plan will be produced for the site. Spill kits and trained personnel on site.							*	Negligible
Process waste contamination	Temporary	Moderate Adverse	Handling of waste on securely bunded and lined areas with petrol interceptors for treatment of waste water prior to discharge. An emergency spillage action plan will be produced for the site. Spill kits and trained personnel on site.							*	Negligible
Decommissioning and Restoration											
Hydrocarbon contamination	Temporary	Moderate Adverse	Installation of drip trays beneath oil tanks/engines/gearboxes/hydraulics where appropriate. Handling of fuel on securely bunded areas. An emergency spillage action plan will be produced for the site. Spill kits and trained personnel on site.							*	Negligible

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)
				I	U K	E	R	C	N P	L	
Process waste contamination	Temporary	Moderate Adverse	Handling of waste on securely bunded and lined areas prior to removal from site. An emergency spillage action plan will be produced for the site. Spill kits and trained personnel on site.							*	Negligible
Cumulative Effects											
None identified											




* **Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; NP = National Park; L = Local






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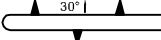
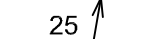

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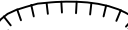




DRIFT

-  Alluvium: Clay and Silt
-  Lacustrine Deposits: Silt, Clay and Sand
-  Sand and Gravel of uncertain age/origin

SOLID

-  Kimmeridge Clay Formation (KC)
-  Middle Calcareous Grit (MCG)
-  Hambleton Oolite (HaO)
-  Passage Beds (PaB)
-  Lower Calcareous Grit (LCG)

-  Development Boundary
-  Geological Boundary, Drift
-  Geological Boundary, Solid
-  Fault at Surface, cross mark indicates downthrow side
-  Convex Break of Slope - Rounded
-  Concave Break of Slope - Rounded
-  Embankment Angle (showing slope)
-  Inclined Strata, dip in degrees
-  Slope Angle

-  BGS-1 Borehole (BGS Reference)
-  Symbol indicates the Quaternary deposit at surface and the Solid formation at rockhead; other Quaternary deposits may intervene
-  Former Infilled Pit / Quarry Site
-  Other Pits
-  Spring
-  Direction of water flow
-  Marsh / Boggy ground
-  Photograph Reference

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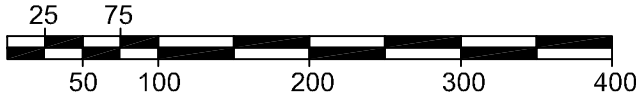
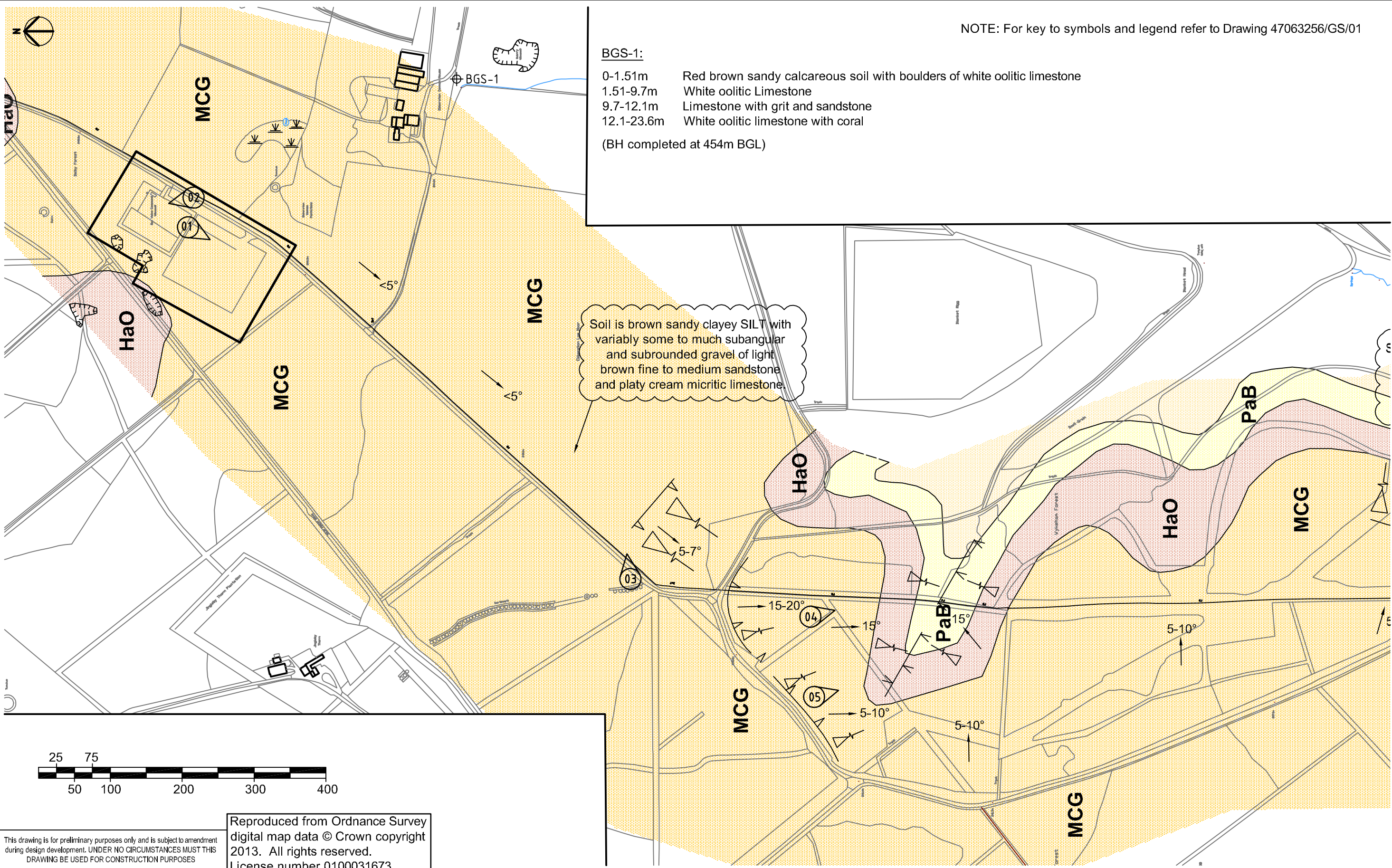
				Project Title GAS PRODUCTION AND PROCESSING FACILITY EBBERSTON EDS, NORTH YORKSHIRE		Drawing Title GENERALISED GEOLOGY PLAN KEY		Purpose of issue DRAFT		This document has been prepared in accordance with the scope of URS appointment with its client and is subject to the terms of that appointment. URS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. Only written dimensions shall be used. © URS Infrastructure & Environment Limited		URS Infrastructure & Environment Limited Royal Court, Basil Close Chesterfield Derbyshire, S41 7SL T 1 2 F 3 V	
				Client THIRD ENERGY				Drawn: SDW Checked: MAC Approved: AK Date: JAN 2013					
Revision Details				By / Check		Date		Suffix					



NOTE: For key to symbols and legend refer to Drawing 47063256/GS/01

- BGS-1:**
- 0-1.51m Red brown sandy calcareous soil with boulders of white oolitic limestone
 - 1.51-9.7m White oolitic Limestone
 - 9.7-12.1m Limestone with grit and sandstone
 - 12.1-23.6m White oolitic limestone with coral
- (BH completed at 454m BGL)

Soil is brown sandy clayey SILT with variably some to much subangular and subrounded gravel of light brown fine to medium sandstone and platy cream micritic limestone.



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Revision Details	By	Date	Suffix

Project Title	GAS PRODUCTION AND PROCESSING FACILITY, EBBERSTON EDS NORTH YORKSHIRE
Client	THIRD ENERGY

Drawing Title	GENERALISED GEOLOGY PLAN
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Purpose of issue	DRAFT			
Drawn	Checked	Approved	Date	
SDW	MAC	AK	JAN 2013	
URS Internal Project No.	Suitability			
47063256				
Scale @ A3	Zone / Mileage			
1:5000				

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FIGURE 15.2	

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