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12.0 GEOLOGY, HYDROGEOLOGY AND LAND CONTAMINATION

12.1 Introduction

- 12.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the Proposed Development near Eggborough, North Yorkshire on geotechnical and geo-environmental ground conditions and groundwater.
- 12.1.2 This chapter describes the existing geological and hydrogeological conditions at the Proposed Development Site (hereafter referred to as 'the Site'), and assess the likely nature and existing sources of contamination which may be present at the Site. In addition, an assessment of the likely ground conditions to be encountered is made, based on a review of existing site investigations conducted at the Site. Having established baseline conditions, an assessment is made of the potential impacts to the existing geological and hydrogeological conditions from the Proposed Development and likely mitigation measures identified.
- 12.1.3 This chapter is supported by Figure 12.1 in ES Volume II, and Appendix 12A (Phase 1 Geotechnical and Geo-Environmental Site Assessment) and Appendix 12B (Groundsure Reports) provided in ES Volume III. It should be noted that some of the potential impacts and effects relating to the hydrogeology underlying the Site are also addressed within Chapter 11: Water Resources, Flood Risk and Drainage of this ES due to the considerable overlap between the two subject areas.

12.2 Legislation and Planning Policy Context

Legislative Background

- 12.2.1 Redevelopment of brownfield land such as the Proposed Power Plant Site must take into account the regulatory context of the work, provide information that is appropriate for development, and be in accordance with UK good practice. An environmental assessment of the condition of the Site must not only consider the potential receptors of human health and controlled waters, but also include a review of the relevant legislation and planning policy that applies to the Site and its immediate environs.

European Legislation

Water Framework Directive (WFD)

- 12.2.2 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) (Commission of the European Communities, 2000) is one of the key European Directives setting the context for the hydrogeological assessment included within this chapter. The purpose of the Directive is to establish a framework for the protection and improvement of groundwater, and inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters. The assessment of surface waters is described in Chapter 11: Water Resources, Flood Risk and Drainage.
- 12.2.3 The Directive requires the UK to classify the current condition of key waterbodies (giving a 'Status' or 'Potential') and to set objectives to either maintain the condition, or improve it where a waterbody is failing minimum targets. Any activities or developments that could cause deterioration within a nearby waterbody, or prevent the future ability of a waterbody to reach

its target Status, must be mitigated so as to reduce the potential for harm and allow the aims of the WFD to be realised.

Industrial Emissions Directive (IED)

- 12.2.4 The Industrial Emissions Directive (IED) (2010/75/EU) was adopted on November 24, 2010 (European Commission, 2010), and entered into force in January 2011. The IED included revisions to the existing Environmental Permitting Regulations (EPR) including the requirement to establish a baseline report for all regulated sites storing and handling hazardous materials as required in Article 22 of the IED. This process is outlined in the European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions (2014/C136/03).
- 12.2.5 This guidance presented a seven-stage approach to generating a ‘baseline report’ which presents the condition of the land under the site for ‘relevant hazardous substances’ present at the site. Following completion of a desktop assessment, collation of a targeted set of baseline site condition data for the site may be needed to meet this requirement, including collection of samples of soil and groundwater and their analysis.
- 12.2.6 Article 16 of the IED requires monitoring of groundwater and soil condition to be carried out every 5 and 10 years respectively, with the scale and scope of this monitoring determined based on the findings of the baseline report.

Groundwater Daughter Directive (GDD)

- 12.2.7 The Groundwater Daughter Directive (2006/118/EC) was adopted in November 2006, and sets out the approach to protect groundwater against pollution and deterioration in response to Article 17 of the Water Framework Directive. The transposition of the GDD into law in England & Wales is achieved through the Groundwater Regulations (2009), implemented in England and Wales through the Environmental Permitting Regulations (2010) and two Directions to the Environment Agency from the Secretary of State and National Assembly for Wales. The first Direction sets out the principles for classifying groundwater and surface water bodies and the second Direction sets out water quality standards and groundwater threshold values.

7th Environment Action Programme (EAP)

- 12.2.8 The 7th EAP (Decision No. 1386/2013/EU) entered into force in January 2014, and is guided by the following long term vision:

“In 2050, we live well, within the planet’s ecological limits. Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society’s resilience. Our low-carbon growth has long been decoupled from resource use, setting the pace for a safe and sustainable global society.”

- 12.2.9 The 7th EAP is based around three priority areas requiring more action, including:

1. protect nature and strengthen ecological resilience;
2. boost resource-efficient, low-carbon growth; and

3. reduce threats to human health and wellbeing linked to pollution, chemical substances, and the impacts of climate change.

12.2.10 In relation to geology, hydrogeology and ground conditions, the first priority area identifies further action on soil protection and sustainable use of land, while the third area covers challenges to human health including air and water pollution, excessive noise and toxic chemicals.

National Legislation

12.2.11 There are three key statutes dealing with the risks posed to human health and the environment associated with historic land contamination, namely:

- Part IIA of the Environmental Protection Act 1990 (the 'Contaminated Land' regime);
- The Water Resources Act 1991; and
- The Town and Country Planning Act 1990.

12.2.12 In the UK, Part IIA of the Environmental Protection Act, as introduced by Section 57 of the Environment Act 1995, makes provision for identifying 'contaminated land', the circumstances in which remediation is required and who is responsible for that remediation. Under Part IIA, 'contaminated land' in respect of which remediation may be required is *"any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substance in, on or under the land, that -*

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being or is likely to be caused."*

12.2.13 Under the Water Resources Act, 'controlled waters' are defined as including both surface waters and groundwater. Once a site is classified as 'contaminated land' then remediation is required to render significant pollutant linkages (*i.e.* the source-pathway-receptor relationships that are associated with significant harm and/or pollution of Controlled Waters) insignificant, subject to a test of reasonableness.

12.2.14 A number of specific regulations have been enacted to implement the statutory European and national legislation into UK law. These regulations include:

- The Anti-Pollution Works Regulations;
- The Control of Pollution (Oil Storage) (England) Regulations;
- The Environmental Damage Regulations; and
- The Environmental Permitting (England and Wales) Regulations, which control discharge of water to surface water and groundwater.

12.2.15 A review of the national, regional and local planning policy pertaining to local ground conditions and contaminated land follows.

Planning Policy Context

National Planning Policy

12.2.16 The Overarching National Policy Statement (NPS) for Energy (EN-1) Section 4.10 (Pollution control and other environmental regulatory regimes) (Department for Energy and Climate Change, 2011a) details that issues relating to discharges or emissions from a proposed project which may affect air quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. Before consenting any potentially polluting developments EN-1 states that:

- *“the relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework; and*
- *the effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits.”*

12.2.17 Section 5.3 of NPS EN-1 (Biodiversity and geological conservation) states that:

“where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity”

12.2.18 Section 5.10 of NPS EN-1 (Land use including open space, green infrastructure & Green Belt) states that:

“applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination”

12.2.19 Section 5.15 of NPS EN-1 (Water Quality and resources) states that

“where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent. The ES should in particular describe:

- *the existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges;*
- *existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies);*

- *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and*
- *any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions.*

12.2.20 NPS EN-2 (Department for Energy and Climate Change, 2011b) on Fossil Fuel Electricity Generating Infrastructure (NPS EN-2) states that where a project is likely to have effects on water quality or resources the applicant for development consent should undertake an assessment which should particularly demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water. The applicant for development consent should demonstrate measures to minimise adverse impacts on water quality and resources.

12.2.21 NPS EN-4 (Department for Energy and Climate Change, 2011c) on Gas Supply Infrastructure and Gas and Oil Pipelines (NPS EN-4) Section 2.22 (Gas and Oil Pipelines Impacts: Water Quality and Resources) notes that the construction of pipelines can create corridors of surface clearance and excavation that can potentially affect watercourses, aquifers, water abstraction and discharge points. Potential pipeline impacts include interference with groundwater flow pathways, mobilisation of contaminants already in the ground, and introduction of new contaminants, and the applicant should provide an assessment of these impacts.

12.2.22 Section 2.23 of NPS EN-4 (Gas and Oil Pipelines Impacts: Soil and Geology) identifies that underground cavities and unstable ground conditions may present risks to pipeline projects, and that applicants should assess the stability of the ground conditions associated with the pipeline route:

“Desktop studies, which include known geology and previous borehole data, can form the basis of the applicant’s assessment. The applicant may find it necessary to sink new boreholes along the preferred route to better understand the ground conditions present. The assessment should cover the options considered for installing the pipeline and weigh up the impacts of the means of installation. Where the applicant proposes to use horizontal directional drilling (HDD) as the means of installing a pipeline under a National or European Site and mitigating the impacts, the assessment should cover whether the geological conditions are suitable for HDD.”

12.2.23 The National Planning Policy Framework (NPPF) (Department of Communities and Local Government, 2012) identifies land contamination as a material consideration in the planning process, stating in paragraph 120 that:

“To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”.

12.2.24 Further, paragraph 121 of the NPPF states that planning policies and decisions should ensure that:

- *“The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation”;*
- *“After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”;* and
- *“Adequate site investigation information, prepared by a competent person, is presented”.*

Local Planning Policy

12.2.25 The Local Plan for Selby is currently undergoing a period of transition, as summarised below:

- adopted 2005 - Local Plan (Selby District Council, 2005);
- not yet adopted (subject to a legal challenge) - Selby District Core Strategy Local Plan (Selby District Council, 2013); and
- undergoing early consultation - Selby Sites and Policies Plan (Selby District Council, 2014).

12.2.26 Policy ENV2 sets out measures for developments on potentially contaminated land, namely:

- A.** *“Proposals for development which would give rise to, or would be affected by, unacceptable levels of noise, nuisance, contamination or other environmental pollution including groundwater pollution will not be permitted unless satisfactory remedial or preventative measures are incorporated as an integral element in the scheme. Such measures should be carried out before the use of the site commences”.*
- B.** *“Where there is a suspicion that the site might be contaminated, planning permission may be granted subject to conditions to prevent the commencement of development until a site investigation and assessment has been carried out and development has incorporated all measures shown in the assessment to be necessary”.*

12.2.27 Policy ENV4 sets out measures for installations handling or storing hazardous substances:

“Proposals involving the storage or use of hazardous substance, or developments in the vicinity of sites where hazardous substances are being stored or used, will only be permitted where the District Council is satisfied that:

- 1) There is no unacceptable risk to the public or the natural environment; and*
- 2) Opportunities for the development of land in the vicinity will not be severely restricted.”*

12.2.28 In addition to The Local Plan for Selby, North Yorkshire County Council (NYCC) has the following local development plans:

- the ‘saved’ policies of the North Yorkshire Waste Local Plan (NYCC, 2006) – adopted 2006; and
- the ‘saved’ policies of the North Yorkshire Minerals Local Plan (NYCC, 1997) – adopted 1997.

-
- 12.2.29 NYCC are also currently preparing a Joint Minerals and Waste Plan.
- 12.2.30 The majority of the ‘saved’ policies of the North Yorkshire Waste Local Plan relate to waste management facilities (defined in the Plan as “*Facilities associated with the processing and disposals of waste materials*”) and are not therefore considered relevant to the Proposed Development as it is not a waste management proposal.
- 12.2.31 None of the ‘Saved’ policies contained in the North Yorkshire Minerals Local Plan are considered to be of relevance to the Proposed Development.

Other Relevant Legislation, Policy, Standards and Guidance

- 12.2.32 The Building Act 1984 is supported by the Building Regulations 2000, which contain detailed information regarding the preparation of a site for redevelopment and resistance to contaminants.
- 12.2.33 The Environment Agency provides general guidance on the management of land contamination in document 'GPLC1 - Guiding Principles for Land Contamination' (Environment Agency, 2010). The Environment Agency also acts as a statutory consultee for developments requiring an EIA. The Environment Agency’s primary concern in the management of contaminated land through the planning regime is in respect of the protection of the water environment.
- 12.2.34 Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11 (referred to in this ES as ‘CLR11’) (Department of the Environment, Food and Rural Affairs (Defra), 2004) outlines the approach for the evaluation of contamination in line with UK Government legislation, Environment Agency and National House-Building Council (NHBC) requirements. The procedures recommend the application of a risk based approach with the first tier assessment being a Phase 1 Desk Top Report to identify previous and current site uses, geological setting and historical contamination records. The approach to further investigation is then based on the risk established by virtue of the Phase 1 Report. If a site has no historical or current evidence of contaminative uses, the scope of further investigation can be less than sites with a long standing history of potentially contaminative uses.

12.3 Assessment Methodology and Significance Criteria

Methodology for Assessing Baseline Conditions

- 12.3.1 Baseline information has been obtained in order to assess the likelihood of finding contamination and its potential nature and extent. In accordance with good practice, baseline conditions have been identified from documentary research of the site history, geology, hydrogeology and hydrology, and review of a commercially available regulatory database. The assessment has involved a review of the Groundsure Reports for the Proposed Power Station and, for the Proposed Gas Connection (Appendix 12B in ES Volume III) existing site investigation reports relating to the wider power station site as well as publically available BGS mapping (BGS, 2016) and the Environment Agency website (EA, 2016). This information has then been used to formulate a Conceptual Site Model to allow an assessment of potential environmental risks. The above information has been synthesised, in order to characterise the baseline conditions of the Site.

12.3.2 Potential receptors were then identified and their relative sensitivity evaluated as described within Table 12.1. The criteria used to determine the sensitivity of receptors and the magnitude of impacts has been developed by technical specialists and has been applied to similar land development proposals. Where appropriate, for the purpose of this assessment, risk likelihood has been interpreted as being equal to the impact rating (e.g. low likelihood/ low impact).

Sensitivity/ Importance of Receptors

12.3.3 Using information gathered during the desk-based study, the presence and relative sensitivity of receptors at risk from potential land contamination and risks to geological/ geomorphologic features have been evaluated by consideration of the following factors:

- surrounding land uses, based on mapping and site visits and consideration of the occupants of adjacent sites;
- proposed end-use, based on the nature of the Proposed Development;
- type of construction operations that will be necessary as part of the Proposed Development;
- surrounding sites of nature conservation importance;
- underlying groundwater;
- surrounding sites and/or areas of geological/geomorphologic importance; and
- geology, hydrogeology and hydrology of the Proposed Development and its surrounding area.

12.3.4 The sensitivity of receptors or geological features that could be affected by the Proposed Development is described qualitatively according to the categories presented in Table 12.1.

Table 12.1: Descriptive scale for sensitivity of receptors

| Qualitative description | Receptor sensitivity | | |
|---|---|-------------------------------------|--|
| | Low | Medium | High |
| End users (operational workers/ visitors) | “Hard” end use (e.g. industrial, car parking) | Landscaping or open space | Residential, allotments and play areas |
| Surrounding land uses | Industrial area | Open space or commercial area | Residential area |
| Construction workers | Minimal disturbance of ground | Limited earthworks | Extensive earthworks and demolition of buildings |
| Ecological sites | No sites of significant ecological value close by | Locally designated ecological sites | Nationally or internationally designated ecological sites, including Sites of Special Scientific Interest (SSSIs), Local and National Nature Reserves, Special Protection Areas etc. |

| Qualitative description | Receptor sensitivity | | |
|-------------------------|--|--|---|
| | Low | Medium | High |
| Built environment | Not applicable | Buildings, including services and foundations | Nationally or internationally designated sites of historic value or other sensitivity |
| Geology / geomorphology | Areas of superficial geology or geomorphologic features with no special significance | Other areas of potential mineral resources Exposed geological features of local importance or educational value | Nationally or internationally designated geological sites Local Geological Sites SSSIs Mineral reserve allocated on Local Minerals Plan |
| Groundwater | Non aquifer Low quality resource No abstractions within 1 km | Secondary Aquifer Abstraction point within 1 km SPZ within 1 km of the Site | Principal Aquifer High quality resource Abstraction point within 250 m SPZ on-site |

12.3.5 The Site was then considered in detail with respect to the proposed construction, operational and decommissioning phases, and any ground contamination or soil quality related impacts considered likely to result are described herein and, where possible, quantified.

Prediction of Potential Impacts

12.3.6 The potential impacts (or risks) associated with contaminated land have generally been assessed by means of a hazard-pathway-receptor model (the Pollutant Linkage), where the following definitions apply:

- hazard = source of contamination;
- receptor = the entity that is vulnerable to harm from the hazard; and
- pathway = the means by which the hazard can come into contact with the receptor.

12.3.7 This assessment considers both the impacts of existing contaminants at the existing coal-fired power station, and the potential for the Proposed Development to impact on land quality and receptors on and adjacent to the Site. The assessment also considers the potential for the Proposed Development to impact upon any geological/ geomorphologic features.

Contamination Sources (Hazards)

12.3.8 Land contamination sources can be described qualitatively according to the categories shown in Table 12.2. This is a qualitative judgement, but has been developed in line with accepted methodology for Phase 1 desk studies and Part IIA contamination studies.

Table 12.2: Descriptive scale for different sources of land contamination

| Qualitative description of source (hazard) | Previous land use |
|--|---|
| Low | Greenfield site, or previous or on-going activities with low potential to cause contamination (e.g. residential, retail or offices) OR site investigation data indicating no significant contamination |
| Medium | Previous or on-going activities with some potential to cause moderate contamination (e.g. railways, collieries, scrap yards) OR site investigation data indicating limited contamination |
| High | Previous or on-going activity on or near to site with high potential to cause land contamination (e.g. gasworks, chemical works, landfills) OR site investigation data including widespread or severe contamination |

12.3.9 If a hazard has been identified and potentially sensitive receptors are present, then the potential impacts associated with the Proposed Development can be predicted by considering the pathways by which the hazard may affect the receptors. Table 12.3 indicates the most likely potential impacts that may occur in relation to the Proposed Development for different categories of receptor.

Table 12.3: Summary of the most likely sources of potential land contamination impacts that may affect sensitive receptors

| End users (operational workers / residents / visitors) | Surrounding land uses (including offsite residential areas) | Construction workers | Sensitive water resources | Ecological sites | Built environment |
|--|--|--|--|--|--|
| Direct or indirect ingestion of contaminated soil (operation). | Inhalation or deposition of wind-borne dust (construction) | Direct or indirect ingestion of contaminated soil (construction) | Existing and/or new pollutant pathways (construction and/or operation) | Phytotoxic impacts on plants (operation) | Chemical attack of buried concrete structures (operation) |
| Concentration of flammable or asphyxiating in-ground gases in enclosed spaces (operation). | Migration of contamination in sub-surface strata (including gases) (construction and/or operation) | Concentration of flammable or asphyxiating gases in confined spaces (construction) | Generation of liquid and/or mobile contaminants (operation) | Toxic impacts on fauna (operation and/or construction) | Concentration of flammable/explosive gases in confined spaces. (operation) |

| End users (operational workers / residents / visitors) | Surrounding land uses (including offsite residential areas) | Construction workers | Sensitive water resources | Ecological sites | Built environment |
|---|---|--|---------------------------|---|---|
| Inhalation of harmful in-ground vapours / dusts indoors and outdoors (operation). | N/A | Inhalation of asbestos during building demolition (construction) | N/A | Indirect impacts via contamination of water resources (operation and/or construction) | Permeation of water supply pipelines. (operation) |

12.3.10 The potential impacts are assessed based on the existing use and predicted construction and operational stages of the Proposed Development.

12.3.11 The magnitude of a potential impact is described wherever possible by using the terms defined in Table 12.4.

Table 12.4: Descriptive scale for the impacts of land contamination

| Magnitude of impact | Examples of typical impacts |
|---------------------|--|
| High | Loss of exposed designated geological feature Very high risk of exposure of a sensitive receptor to potentially harmful levels of contamination via a confirmed pathway |
| Medium | Quarrying of rock for imported fill, or substantial changes due to cuttings Proven source – pathway – receptor pollutant linkage identified with elevated level of contamination recorded/ or potential to be present |
| Low | Superficial disturbance to geology; changes in geomorphology Identified source – pathway – receptor pollutant linkage identified but contamination likely to be low risk |
| Very low | Changes to made ground deposits No source – pathway – receptor pollutant linkage identified |

Significance of Effects

12.3.12 For each of the potential impacts identified, an assessment has been made of the likely level of the significance of effects.

12.3.13 Where geological receptors are present, then their importance (sensitivity) has been determined (see Table 12.1) and the potential impact of the Proposed Development qualitatively predicted (see Table 12.4).

12.3.14 Effects are classified based on the identified sensitivity/ importance of the receptor and the predicted magnitude of the impact, using the standard assessment matrix set out in Table 12.5, in conjunction with professional judgement of site-specific factors that may be of relevance.

Table 12.5: Matrix to determine the significance of an effect (prior to mitigation)

| Magnitude of impact | Sensitivity/ importance of receptor | | | |
|---------------------|-------------------------------------|------------|------------|------------|
| | High | Medium | Low | Very Low |
| High | Major | Major | Moderate | Minor |
| Medium | Major | Moderate | Minor | Negligible |
| Low | Moderate | Minor | Negligible | Negligible |
| Very low | Minor | Negligible | Negligible | Negligible |

- 12.3.15 This chapter considers that major or moderate effects are significant for the purposes of the EIA Regulations, in accordance with standard EIA practice.
- 12.3.16 If potentially significant effects are identified, measures are proposed to mitigate the risks from the hazards. However, industry best practices will be applied whether there is the potential for significant effects, or not. The assessment is undertaken on the assumption that best practice will be implemented during construction and operation. The generic categories of mitigation are outlined in Table 12.6.

Table 12.6: Generic categories of mitigation

| Category of mitigation | Description of mitigation measures |
|---|--|
| Remedial works | Remedial work may be required to allow the development to proceed. The scope and nature of any remedial work is likely to be highly dependent on the results of investigations and subsequent risk assessments. |
| Design changes | Significant effects can be reduced by changes in design <i>e.g.</i> protective measures to prevent build-up of flammable gases, or modification of layouts to ensure that sensitive end uses are sited away from likely areas of contamination. Relocation of built features away from geologically important features. Consideration of the construction method proposed for underground structures to minimise potential impacts on groundwater. |
| Protective measures during construction | Many of the potentially significant effects on the construction workforce can be mitigated by the use of appropriate protective equipment, such as gloves and respiratory protection, and effective dust suppression techniques. |
| Environmental management | Environmental management may be required to prevent construction work and future operations from giving rise to land contamination |

Key Parameters for Assessment

- 12.3.17 As set out in Chapter 4: The Proposed Development, there are areas for which there is currently variability in the design that could affect the assessment. These are defined as maximum and minimum parameters under the Rochdale Envelope.

- 12.3.18 The Rochdale Envelope defined for building sizes and limits of deviation for building locations do not affect this assessment and is therefore not considered further.

Extent of Study Area

- 12.3.19 The Site encompasses the land required for the construction and operation of the Proposed Development and associated connections including: cooling water connections, borehole water connections, electricity connection, and the gas pipeline route. The Proposed Power Plant Site is located on the existing coal stockyard (see Figure 3.1 in ES Volume II). The route of the Proposed Gas Connection is shown in Figure 3.2 (ES Volume II).
- 12.3.20 To ensure all potentially significant influences on conditions within the Site are understood, the study area (shown on Figure 12.1) encompasses:
- the Site; and
 - (for licensed discharge consents and Environment Agency recorded pollution incidents) a 500 m buffer around the Site; and
 - (for surface water abstraction licences) a 2 km buffer around the Site.

Information Sources

Desk Study

- 12.3.21 A Phase 1 Geotechnical and Geo-Environmental Site Assessment (Appendix 12A in ES Volume III) was conducted to determine the baseline ground conditions and potentially contaminative land uses. As part of this assessment, Groundsure Reports for the Proposed Power Station (including the Proposed Cooling Water Connections) and Proposed Gas Corridor were commissioned from Groundsure Limited (Appendix 12B in ES Volume III).
- 12.3.22 The Groundsure Reports summarise environmental information typically available in the public domain from a variety of sources. Information is included on authorisations, permits, discharge consents, water abstractions, groundwater, surface water, ecological sensitivities, licensed waste management and disposal facilities, consented trade effluent discharges, records of unlicensed landfills in the search area, trade directory entries of potentially contaminating activities, Control of Major Accident Hazards (COMAH) registered sites, radon risk, coal (and other) mining and natural subsidence risk, and sensitive land uses (nature reserves, protected areas, sensitive habitats). It is noted that the Groundsure database is updated periodically and therefore it may not document recent developments/ registrations in the site area or activities which have not been declared.
- 12.3.23 In addition, copies of previous investigations conducted at the site were made available by Eggborough Power Limited (EPL) (the Applicant) for review, including:
- Strata Surveys Limited, 2012. Ground Investigation Report at Eggborough Power Station, Pontefract;
 - Wilkinson Associates, 2000. Soils Investigation – Flue Gas Desulphurisation Plant, Eggborough Power Station;
 - Exploration Associates, 2001. Factual Report on Ground Investigation at Eggborough Power Station FGD Volume 1;

- Arup, 2002. Mowlem Engineering Ltd, Eggborough Flue Gas Desulphurisation Plant Geotechnical Interpretative Report;
- Soil Mechanics, 1996. Ground Investigation for a Proposed Glass Making Plant at Eggborough, North Yorkshire.
- Arup, 2008. Engineering Mining Subsidence Structural Assessment at Eggborough Power Station;
- Geosyntec, 2016. Eggborough Power Station Site Protection and Monitoring Programme – Annual Report 2015;
- Fugro, 2009 Geophysical Investigation at Eggborough Power Station;
- Wardell Armstrong, 2009. Letter entitled ‘Eggborough Power Station Mining & Geology Update’; and
- Wardell Armstrong, 2010. Geological Report on the Investigation of Faulting in the Vicinity of Eggborough Power Station.

Consultation

12.3.24 Consultation undertaken during the preparation of this ES Chapter is presented in Table 12.7 below.

Table 12.7: Consultation summary table

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|-----------------|--|---|--|
| Natural England | 30 th August 2016 (e-mail response included in Scoping Opinion) | The EIA will need to “ <i>consider any impacts upon local geological sites</i> ”, and include “ <i>an assessment of the likely impacts on the geodiversity interests of such sites, and include proposals for mitigation of any impacts and if appropriate, compensation measures</i> ”. | Presence of any geological sites of interest have been identified from the Groundsure Report, risks to these sites been assessed and if required mitigation measures identified. |
| | 10 th February 2017 (response to consultation on PEI Report) | “ <i>Natural England notes that the proposed power plant will be more than 10km from any nationally or internationally designated nature conservation sites. We do not consider that there are likely to be significant effects on any such sites from the proposal, due to the distance from the nearest site and the absence of any pathways for potential effects.</i> ” | No sensitive risk with respect to geology were identified and no further assessment is required. |

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|-----------------------|--|---|---|
| Public Health England | 6 th September, 2016 (letter included in Scoping Opinion) | The ES should clearly identify <i>“the location and distance from the development of off-site human receptors and environmental receptors such as the surrounding land, watercourses, surface and groundwater, and drinking water supplies such as wells, boreholes and water abstraction points”</i> . | Presence of nearby groundwater abstraction wells have been identified from the Groundsure Report and potential impacts to these assessed. |
| The Coal Authority | 13 th September 2016 (e-mail included in Scoping Opinion) | <i>“the site does fall within the licence area of Kellingley Colliery, which ceased deep underground coal mining activity in December 2015.”</i> <i>“the longwall method of mining employed can potentially result in surface subsidence for several years following cessation of mining ”</i> <i>“the longwall method of mining employed can potentially result in surface subsidence for several years following cessation of mining activities. It is assumed that this potential land instability risk will therefore be afforded due consideration as part of the design process for this development and the accompanying Environmental Statement.”</i> | Ongoing assessment of the rates of potential settlement being experienced across the coal stockyard is being undertaken and reported elsewhere. If required, mitigation measures will be identified during the detailed design. |
| | 17 th February 2017 (letter response to consultation on PEI Report) | <i>“The Coal Authority is therefore pleased to note that due consideration has been afforded to this potential land stability risk as part of Chapter 12 of the Preliminary Environmental Information Report – Volume 1 (January 2017). Confirmation is provided within the table and</i> | Ongoing monitoring results will be considered by the contractor to inform the detailed design. |

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|--------------------|--|---|--|
| | | <p><i>paragraphs 12.4.19 to 12.4.23 that ongoing assessment is being made regarding settlement rates and that, based on this monitoring, mitigation measures will be identified during the detailed design, if necessary. Accordingly, a conclusion is reached at paragraph 12.4.23 that the sensitivity of the geology is moderate, due to the past underground coal mining activity."</i></p> | |
| Environment Agency | <p>16th September 2016 (letter included in Scoping Opinion)</p> | <p><i>"We agree with the characterisation of the site's geology and hydrogeology. We are satisfied that the groundwater sensitivity beneath the main site has been classed as high, given the relatively thin and permeable superficial deposits which do not afford much protection to the groundwater should a pollution incident occur." "The main site is ... partially located within a Safeguard Zone (SgZ) for nitrate within a Drinking Water Protected Area (DWPA)."</i></p> | <p>Potential risks to groundwater during construction and operation of the Proposed Development will be considered and appropriate mitigation measures identified and adopted</p> |
| | <p>17th February 2017 (letter response to consultation on PEI Report)</p> | <p><i>"Overall, we remain satisfied with the characterisation of the site's geology and hydrogeology. We also agree with the conceptual model's output in terms of groundwater risks. The site's former use as a power station means that contamination could be easily be mobilised during construction and operation, thereby polluting controlled waters. Controlled waters are particularly sensitive in this</i></p> | <p>Potential risks to groundwater during construction and operation of the Proposed Development will be considered and appropriate mitigation measures identified and adopted in accordance with</p> |

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|--|--|--|---|
| | | <p><i>location, as the site is located on a principal aquifer within a source protection zone 3. Given the above, we would likely recommend that conditions were applied to the DCO which:</i></p> <ul style="list-style-type: none"> • <i>Ensured the effective remediation of any contamination</i> • <i>Ensured that we were able to review any penetrative piling methods prior to their operation</i> • <i>Ensured that any groundwater risks had been minimised during construction, via the production of a construction environmental management plan</i> • <i>Ensured that all oils/fuels were stored in such a way so as not to cause pollution”</i> | <p>draft DCO Requirements relating to contaminated land and groundwater, piling and penetrative foundation design and CEMP.</p> |
| <p>North Yorkshire County Council and Selby District Council</p> | <p>17th February 2017 (letter response to consultation on PEI Report)</p> | <p>1) <i>“the proposed cooling water and gas connection routes are located primarily along agricultural land. Potential pipeline impacts include interference with groundwater flow pathways, mobilisation of contaminants already in the ground, and introduction of new contaminants. In accordance with National Policy Statement (NPS) EN-4 (Gas Supply Infrastructure and Gas and Oil Pipelines) the applicant should assess the ground conditions associated with the pipeline route and incorporate the findings of that assessment in the Environmental Statement</i></p> | <p>1) Based on the findings of the Phase 1 assessment (Appendix 12A in ES Volume III), no significant issues with respect to ground conditions on the route of the Proposed Cooling Water and Gas Connection pipelines have been identified. Should any issues be identified during a future ground</p> |

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|-----------|-------------------------------|---|---|
| | | <p>(ES).”</p> <p>2) <i>“The appointed contractors will be required to produce a Construction Environmental Management Plan (CEMP) that will provide details of proposed control measures in relation to land contamination, in particular the implementation of pollution control measures to deal with any contaminated land encountered during the construction works. It is noted in Section 12.5.9 that any such investigations will be required to be undertaken in consultation with the Environment Agency and ‘other appropriate consultees’. I would request that Selby District Council is included as a consultee on this matter.”</i></p> <p>3) <i>“3 pollution incidents located 123m SE of the main site as recorded by the Environment Agency. Whilst on-site pollution incidents have been considered as a potential source of contamination in the Phase 1 ESM (as having a minor impact to land), these off-site pollution incidents are recorded as having a significant impact to land. The risk of migrating contaminants from these pollution incidents should be considered within the preliminary CSM as a potential pollutant linkage.”</i></p> <p>4) <i>“a site specific intrusive investigation will be undertaken prior to the commencement of construction work... in accordance with the recommendations as detailed in Section 13.2 of the Phase 1 ESA</i></p> | <p>investigation, appropriate mitigation measures will be adopted in accordance with a draft DCO Requirement.</p> <p>2) The CEMP prepared in accordance with a draft DCO Requirement is to be submitted to and approved by the relevant local planning authority (Selby District Council).</p> <p>3) The pollution incidents referred to occurred downstream, and on the opposite side of a large embankment. As such, these are not considered to represent a plausible potential source of pollution to the Site.</p> <p>4) A scheme to deal with contaminated land and groundwater will be prepared prior to construction in accordance with a draft DCO</p> |

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|-----------|-------------------------------|--|---|
| | | <p><i>and with regard to the preliminary CSM as detailed in Section 12.”</i></p> <p>5) <i>“details of land ownership and/or wayleaves or similar that govern the ownership, control and responsibilities of stakeholders in the land through which the pipeline crosses is not clear. It should be made clear who will be responsible in the occurrence of contaminated land.”</i></p> | <p>Requirement.</p> <p>5) Requirements in the draft DCO (Schedule 2) deal with contamination from a consenting perspective.</p> |

Summary of Key Changes to Chapter 12 since Publication of the Preliminary Environmental Information (PEI) Report

- 12.3.25 The PEI Report was published for statutory consultation in January 2017, allowing consultees the opportunity to provide informed comment on the Proposed Development, the assessment process and preliminary findings through a consultation process prior to the finalisation of this ES.
- 12.3.26 The key changes since the PEI Report was published are summarised in Table 12.8 below.

Table 12.8: Summary of key changes to Chapter 12 since publication of the PEI Report

| Summary of change since PEI Report | Reason for change | Summary of change to chapter text in the ES |
|---|----------------------------|---|
| A cofferdam has been confirmed as being required at the Proposed Cooling Water Connection abstraction and discharge locations – this was only discussed as a possibility in the PEI Report. | Updated design information | Additional text added to ‘Possible Foundation Solutions’ of Section 12.5 to discuss sheet piling requirements for the cofferdam at the Proposed Cooling Water Connection abstraction and discharge locations. |

12.4 Baseline Conditions

Existing Baseline

- 12.4.1 This section describes the Site in its current state (without the Proposed Development) and the sensitivity of the receiving environment to change.

Designated Sites

- 12.4.2 The Site is located within a nitrate vulnerable zone (which is considered to have a moderate sensitivity).
- 12.4.3 No other environmentally sensitive sites, including Sites of Special Scientific Interest, Special Protection Areas, Special Areas of Conservation, Ramsar sites, or National and Local Nature Reserves, were identified within 2 km of the Site.

Existing and Previous Land Uses

- 12.4.4 Table 12.9 details the history of the areas of the Site within the existing coal-fired power station site as based on available OS historical mapping (Appendix 12A, ES Volume III).

Table 12.9: Review of historical maps relating to the existing coal-fired power station

| Date | Onsite Land Use | Offsite Land Use |
|-----------|---|---|
| 1852-1855 | Agricultural land use. | Agricultural land use. |
| 1891-1894 | No significant changes. | Railway line approximately 750 m south of the Site; and Gravel pits approximately 750 – 900 m south of the Site. |
| 1905-1908 | No significant changes. | Gravel pit located approximately 500 m east of the Site; and Water works located adjacent to the west of the Site. |
| 1948-1950 | Numerous sand and gravel pits located on site. | Water works adjacent to the eastern corner of the Site; and Additional sand and gravel pits from approximately 300 m south of the Site. |
| 1955-1957 | No significant changes. | No significant changes. |
| 1973 | Eggborough Power Station has been constructed, including railway line, ash tip, tanks, lagoons etc. Sewage works present in north-eastern corner. | The majority of previous sand and gravel pits are no longer shown. |
| 1983 | No significant changes. | No significant changes. |
| 2002 | No significant changes. | A works complex has been constructed adjacent to the southwest of the Site (inferred to be the current glassworks and business park); Reservoir approximately 250 m south of the Site; and Depot and works approximately 600 m south of the Site. |

| Date | Onsite Land Use | Offsite Land Use |
|------|-------------------------|-------------------------|
| 2010 | No significant changes. | No significant changes. |
| 2014 | No significant changes. | No significant changes. |

12.4.5 Prior to its development as a power station in the 1960s, the existing power station site was primarily used as agricultural land. A number of sand and gravel pits were present on site and within 1 km of the site between the later 1800s and the 1970s, which are inferred to have since been backfilled. A limited number of other potential sources of contamination have been identified from the historical maps including a railway, water works, sewage works, infilled pond/ moat and nearby industrial land use.

12.4.6 The Proposed Cooling Water and Gas Connection routes are located primarily on agricultural land. Based on a review of the historical development of the Proposed Cooling Water and Gas Connection corridors, no significant potential sources of contamination were identified.

Surrounding Area

12.4.7 Between 1899 and the present day, the surrounding area has been occupied by potentially contaminative land uses including a power station, water works and a railway line.

12.4.8 Railway lines are located approximately 750 m south of the Proposed Power Plant Site (the Knottingley to Goole railway line) and approximately 200 m to the north-east of the Proposed Gas Connection (the East Coast Main Line).

12.4.9 Eggborough coal-fired Power Station was constructed between 1962 and 1973, including railway line, ash tip, tanks, lagoons, drainage, material storage.

12.4.10 Based on this risk outline, there is the potential for contamination to present a medium hazard to environmental receptors.

Superficial Geology

12.4.11 A review of the Groundsure Reports (Appendix 12B, ES Volume III), British Geological Survey (BGS) 1:50,000 solid and drift geology sheet 79 for Goole, existing site investigation records and publically available BGS borehole records have been reviewed to identify the likely geological sequence at the Site.

12.4.12 From a review of BGS information and the geology sections of the Groundsure Reports (Appendix 12B, ES Volume III), the following superficial deposits have been identified as potentially being present beneath the Site:

- alluvium;
- Lacustrine beach deposits;
- Brighton sand formation;
- Hemingbrough glacio-lacustrine; and
- Glacial till.

12.4.13 The relative extent of the uppermost superficial deposits in relation to the Site is discussed in more detail below.

Superficial Geology – Proposed Power Plant Site

- 12.4.14 Based on a review of the BGS sheets and Groundsure Report, superficial deposits are shown to be absent from much of the Proposed Power Plant Site, with the following exceptions:
- Lacustrine beach deposits – shingle, sand, silt and clay; present at the north-western corner of the Proposed Power Plant Site;
 - Hemingbrough glacio-lacustrine deposits shown to underlie the south-eastern corner of the Proposed Power Plant Site; and
 - glacial till – typically sandy and gravelly clays, with cobbles and boulders. The geological map indicates that these deposits may encroach onto the extreme south-western corner of the Proposed Power Plant Site.
- 12.4.15 Given much of the Proposed Power Plant Site is occupied by the coal stockyard for the existing coal fired power station, the presence of made ground is also anticipated.

Superficial Geology – Proposed Gas Connection and Cooling Water Connections

- 12.4.16 From the online BGS geological map and Groundsure Report, the following units are anticipated to comprise the uppermost superficial deposit across the Proposed Cooling Water Connections and Proposed Gas Connection corridor:
- a 250 m corridor immediately northeast of Wand Lane = Brighton Sand;
 - River Aire channel (extending approximately 1.2 km north-east to approximately Millfield Road) = Alluvium;
 - 300 m band from Millfield Road access to approximately Fox Lane access = Brighton Sand; and
 - Fox Lane access to West Lane = Hemingbrough Formation.

Bedrock Geology

- 12.4.17 The geological map and Groundsure Report indicate that the Site (including both Proposed Power Plant Site and Proposed Cooling Water and Gas Connections) is underlain by Sherwood sandstone. The following boreholes located close to the Site encountered Sherwood sandstone:
- SE52SE99, located adjacent to the (Borehole No2) encountered Sherwood sandstone to a minimum depth of 90 m below ground level (bgl), and did not penetrate the full thickness of the unit;
 - SE52SE43, located adjacent to Wand Lane immediately east of the Site encountered Sherwood sandstone to a minimum depth of 93 m bgl, and did not penetrate the full thickness of the unit; and
 - SE52SE41, located immediately south of the junction between the A19 and Weeland Road, south of the Site (Borehole No.1), encountered Sherwood sandstone to a maximum depth of 86 m bgl, with Permian Marl below this.

Coal Mining

- 12.4.18 The Groundsure Report (Appendix 12B, ES Volume III) indicates that the Site lies within an identified coal mining reporting area. The Coal Authority Report indicates that the Proposed

Power Plant Site is in an area that could be affected by underground mining in one seam of coal located at a depth of 730 m to 760 m and last worked in 2015. The Coal Authority Report records four damage claims relating to ground subsidence, two located on the Proposed Power Plant Site and two located within 50 m of the Proposed Power Plant Site.

- 12.4.19 The Proposed Power Plant Site is understood to have experienced surface settlement as a result of the Kellingley coal mining. Mining at Kellingley Colliery ceased in December 2015, with the last coal seam mined beneath the southern boundary of the Site. The Beeston Coal Seam was the only seam worked at Kellingley Colliery. This seam was typically 2.6 m thick, and was worked at a depth of approximately 735 m bgl beneath the Proposed Power Plant Site.
- 12.4.20 The Coal Mining Abandonment plans (Catalogue No.:18339 Sheets 5, 10 and 11 of 35) indicate that the mined panel closest to the Proposed Power Plant Site is panel YZ502, which reached a final stop position in October 2012. Settlement monitoring commenced around the perimeter of the Proposed Power Plant Site in December 2013. By August 2014 settlement in the far south of the Proposed Power Plant Site reached approximately 100 mm, reducing to less than 5 mm in the north-western corner. Between August 2014 and August 2016, recorded settlement around the perimeter of the Proposed Power Plant Site was approximately 10 mm. This suggests that settlement on the Proposed Power Plant Site is reducing and is nearing completion.
- 12.4.21 Monitoring of ongoing potential settlement across the Proposed Power Plant Site is ongoing, and will be reported on as the results of future monitoring events become available.
- 12.4.22 The sensitivity of the geology is moderate, based on the previous coal mining at the Site.

Hydrogeology

- 12.4.23 The EA aquifer classifications for the identified superficial deposit and bedrock underlying the Site is summarised in Table 12.10 below:

Table 12.10: Summary of EA aquifer classifications

| Formation | EA aquifer classification | Aquifer definition |
|-----------------------------|------------------------------------|---|
| Superficial deposits | | |
| Lacustrine Beach Deposits | Secondary A Aquifer | Defined by the EA as ‘permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers’. |
| Alluvium | Secondary A Aquifer | |
| Brighton Sand | Secondary A Aquifer | |
| Glacial Till (clay) | Secondary Undifferentiated Aquifer | Defined by the EA as ‘an aquifer where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.’ |

| Formation | EA aquifer classification | Aquifer definition |
|------------------------|---------------------------|--|
| Hemingbrough Formation | Unproductive Strata | Defined by the EA as ' <i>rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow</i> '. |
| Bedrock | | |
| Sherwood Sandstone | Principal Aquifer | Defined by the EA as ' <i>layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer</i> '. |

- 12.4.24 Soils at the Site (except those associated with glacial till and glaciolacustrine deposits) are classified as having a high leaching potential, meaning that they may readily transmit liquid discharges and pollutants.
- 12.4.25 The Site, with the exception of the southern Proposed Borehole Water Connection and the northern end of the Proposed Gas Connection, is located in a groundwater Source Protection Zone (SPZ) 3 (total catchment).
- 12.4.26 The Groundsure Report (Appendix 12B, ES Volume III) records two active groundwater abstractions on the Proposed Power Plant Site; one for EPL for the abstraction of a maximum of 4,800 m³ per day for use as a boiler feed and one for The Hambleton Abstraction Partnership for the abstraction of a maximum of 900 m³ per day for use in irrigation. Both abstractions are from the Sherwood Sandstone Principal Aquifer. There are also a further thirty-nine historical groundwater abstraction licences recorded 2 km of the Site including for potable water, farming and domestic use.
- 12.4.27 There are no groundwater abstractions within the Proposed Gas Connection corridor.
- 12.4.28 Based on the presence of Secondary A Aquifers in superficial drift deposits and bedrock comprising a Principal Aquifer, coupled with the high leaching potential, groundwater at the Site is considered to represent a highly sensitive receptor.

Radon

- 12.4.29 The Groundsure Report (Appendix 12B, ES Volume III) indicates that the Site is not in located a Radon Affected Area, as less than 1% of properties are above the Action Level and no radon protective measures are necessary in construction of new properties or extensions.

Previous Investigations of the Site

- 12.4.30 The following historical reports have been reviewed as part of the Phase 1 desk study (Appendix 12A, ES Volume III):

- Ground Investigation for a Proposed Glass-making Plant at Eggborough, North Yorkshire, Soil Mechanics, dated July 1998;
- Soils Investigation – Flue Gas Desulphurisation Plant, Eggborough Power Station, Wilkinson Associates, dated 10th November 2000;
- Eggborough Power Station FGD – Factual Report on Ground Investigation, Exploration Associates, dated December 2001;
- Geotechnical Interpretative Report – Eggborough Flue Gas Desulphurisation Plant, Ove Arup & Partners, dated February 2002;
- Geophysical Investigation – Eggborough Power Station, Fugro Aperio, dated April 2009;
- Geological Report on the Investigation of Faulting in the Vicinity of Eggborough Power Station, Wardell Armstrong, March 2010;
- Ground Investigation Report - Factual Report on a Ground Investigation at Eggborough Power Station, Pontefract, Strata Surveys Limited, dated 8th August 2012; and
- Eggborough Power Station Site Protection and Monitoring Programme – Annual Report 2015, Geosyntec, dated 4th January 2016.

Soil Mechanics (1998)

12.4.31 Soil Mechanics undertook a ground investigation at the location of the Saint Gobain glassworks, approximately 100 m south-west of the Site, in 1998. A summary of information considered relevant to the Site is provided below:

- twenty-seven boreholes were advanced by cable percussion and rotary coring and nineteen trial pits were excavated to a maximum depth of 25.7 m bgl in April/ May 1998;
- no Made Ground was encountered, consistent with the lack of previous development of the investigation location. However sandy topsoil was present to a depth of approximately 0.4 m;
- superficial deposits were found to comprise glacial clay, sand and gravel, ranging in thickness from 2.0 m to 12.9 m and generally thickening towards the north. The sand and gravel was reported to be loose to dense;
- Sherwood Sandstone was encountered beneath the superficial deposits as very weak to moderately weak red-brown sandstone. Occasional layers of mudstone were identified; and
- groundwater level was noted to have been artificially lowered by pumping at the power station, however groundwater was encountered in boreholes at the far north of the investigation area (furthest from the abstraction borehole). Perched groundwater was also encountered in the superficial deposits towards the northeast.

Wilkinson Associates (2000)

12.4.32 Wilkinson Associates undertook an investigation on behalf of Kvaerner E&C UK Limited October 2000 with the aim of providing an assessment of ground conditions for a proposed FGD Plant. A summary of information is provided below:

- the investigation comprised the drilling of eight boreholes to a maximum depth of 11.1 m bgl and excavation of four trial pits to a maximum depth 3.0 m bgl;
- Made Ground was encountered at all locations between a thickness of 0.3 – 0.9 m, generally consisting of sands and gravels;

- in eight locations, the Made Ground was found to directly overlie weathered Sherwood Sandstone. In the remaining three locations, towards the north-east of the investigation area, glacial sand and gravel was encountered at a thickness of 1.2 – 2.3 m;
- Sherwood Sandstone bedrock was found to be weathered in all locations ranging from grade VI (residual soil) close to the surface to grade III (moderately weathered) at the base of the boreholes. Geotechnical testing (unconfined compressive strength) indicated that the rock was moderately weak;
- no significant groundwater was encountered. The report notes that this is consistent with the 1982 published hydrogeological map which records groundwater at a depth of approximately 12 m bgl in the area of investigation;
- no soil or groundwater samples were submitted for chemical analysis; and
- the report concluded that conventional spread foundations would likely be suitable for the proposed FGD plant.

Exploration Associates (2001)

12.4.33 In December 2001, Exploration Associates were commissioned to conduct a site investigation in order to help better understand the ground conditions at the site of the proposed FGD plant. A summary of information is provided below:

- four boreholes were drilled by cable percussion and rotary coring techniques to a maximum depth of 25.5 m bgl and ten trial pits were excavated to a maximum depth of 3.5 m bgl. Cone Penetration Tests (CPT) were undertaken at a further twenty-two locations. A crosshole seismic survey was also undertaken to determine the shear wave velocity profile;
- Made Ground was encountered at a thickness of 0.5 - >1.2 m, generally comprising sands and gravels;
- superficial deposits of glacial sand and gravel were encountered at all borehole locations at a thickness of approximately 1.5 – 2.5 m;
- Sherwood Sandstone bedrock was encountered as a weakly cemented, weathered sandstone; and
- groundwater strikes were encountered at approximately 9.0 – 15.6 m bgl during drilling, with a standing water level of 1.7 m bgl recorded during post-fieldwork monitoring.

Ove Arup & Partners (2002)

12.4.34 A Geotechnical Interpretative Report was prepared by Ove Arup in 2002 based on the results of the Wilkinson Associates and Exploration Associates investigations, as well as a desk study carried out by Ove Arup (not available for review). A summary of information from the interpretative report is provided below:

- an 'odour' was encountered in two locations;
- Made Ground is generally medium dense to dense and likely suitable for re-use as engineered fill if required;
- design Class DS1 sulphate resisting concrete was recommended for foundations based on pH and sulphate analysis of soil; and
- groundwater elevation is likely around 0 m AOD in the Sherwood Sandstone; and
- glacial sands and gravels and Sherwood sandstone in the FGD Plant area provide generally favourable conditions for foundations. Pad or raft foundations could be used in either strata, or piles could be extended into the Sherwood Sandstone.

Fugro (2009)

12.4.35 A geophysical investigation was conducted for EPL by Fugro to investigate the potential presence of faults beneath the existing coal-fired power station footprint. Previous 'deep' seismic investigations carried out in the area on behalf of UK Coal indicated highly reflective strata within the underlying Permo-Triassic sequence. Electrical resistivity tomography and multichannel seismic reflection techniques were deployed to explore to 30 m and 250 m depth respectively. The key findings included:

- structural discontinuities were identified within reflection data that were consistent with post-Permian faulting;
- reflection data were consistent with the presence of an unnamed fault previously identified to the north of the existing coal-fired power station;
- data suggested the absence of north-west south-east fault shown on a historic BGS map beneath the existing coal-fired power station; and
- the vulnerability of the existing coal-fired power station to fault reactivation through subsurface coal mining was likely to be greatest from those existing structures that may link the proposed mining area to the existing power station on its eastern flank.

Wardell Armstrong (2010)

12.4.36 Wardell Armstrong completed a review of the seismic surveys completed by Fugro (2009), and consulted with UK Coal Mining Ltd (UKMCL) to reassess the potential presence of faults beneath the site. The key findings included:

- the major fault shown on the 1971 published BGS map, the Bowers House Fault, does not pass through the existing coal-fired power station site;
- correlation with parts of the Kellington fault zone, probably passing through the northern part of the existing coal-fired power station site but probably outside the area of influence of the mining; and
- further evidence of faults which appears to be parts of a zone of irregular minor faults previously interpreted by UKMCL from detailed seismic surveys of the Beeston mining panels and intersected by underground roadways, which may pass beneath the power station.

Strata Surveys Limited (2012)

12.4.37 Strata Surveys' ground investigation in 2012 focussed on the coal stockyard area. A summary of information is provided below:

- twenty-two boreholes were drilled by cable percussion and rotary coring techniques to a maximum depth of 25.0 m bgl and eleven trial pits were excavated to a maximum depth of 4.6 m bgl. Samples were collected for chemical testing and field and laboratory geotechnical testing was carried out;
- Made Ground in the coal stockyard comprised coal as fine to coarse gravels at a thickness of 0.2 m – 9.9 m, as well as localised sand, limestone gravel and brick fragments;
- superficial deposits of soft to firm gravelly clay, often interbedded with sand, were encountered in the southern part of the coal stockyard. Elsewhere on the coal stockyard and existing main power station site, glacial sand and gravel was encountered. The base of the superficial deposits was encountered between 1.7 and 3.7 m bgl;

- Sherwood Sandstone bedrock in the coal stockyard area was encountered at depths ranging from 0.8 m - 10.3 m bgl, and on the existing main power station site from 0.4 m - 2.00 m bgl;
- groundwater monitoring wells were installed in six locations, which returned standing elevations of 4.1 – 9.0 m bgl in June/ July 2012; and
- thirteen soil samples and five groundwater samples were scheduled for chemical analysis. Identified impacts included Polycyclic Aromatic Hydrocarbons (PAHs) Total Petroleum Hydrocarbons (TPH) and BTEX (benzene, toluene, ethylbenzene and xylene) in Made Ground as well as TPH in groundwater.

Geosyntec (2016)

12.4.38 Geosyntec have undertaken regular groundwater monitoring as part of Eggborough Power Station’s Site protection and Monitoring Programme (SPMP) since 2008 in line with the requirements of the Environmental Permit to identify potential changes in groundwater quality as a result of the permitted operations. A summary of information considered relevant to the study site is provided below:

- groundwater flow direction is inferred to be radial towards the south and west from a high point in the northern-central part of the existing coal-fired power station site;
- a general decrease in pH (*i.e.* increase in acidity) of groundwater has been observed; and
- chemical concentrations in groundwater are generally consistent with historical trends, However molybdenum, a potential indicator of PFA contamination, has been identified in a number of locations in 2015.

Summary of Anticipated Ground Conditions – Proposed Power Plant Site

12.4.39 The ground investigation completed on the coal stockyard area (Strata Surveys, 2012) identified that the ground conditions beneath the northern part of the Proposed Power Plant Site comprised a mantel of made ground comprising black coal to 0.5 m to 1.5 m bgl, overlying completely weathered sandstone bedrock (Sherwood Sandstone). Competent sandstone bedrock is encountered at a relatively shallow depth across the coal stockyard area, as shown in Table 12.11 below:

Table 12.11: Generalised Ground Conditions Beneath the Proposed Power Plant Site

| Geological unit | Top of strata (metres below ground level) | Description |
|--------------------------------------|---|--|
| Made ground | Ground surface | Black coal, recovered and fine to coarse gravel sized fragments (coal carpet). |
| Weathered Sherwood sandstone bedrock | 0.5 – 1.5 | Extremely weathered red brown sandstone. |
| Sherwood sandstone bedrock | 4.0 – 7.0 | Highly weathered red brown sandstone. |

12.4.40 Previous reports and geophysical investigations (Arup, 2008, Fugro, 2009, Wardell Armstrong, 2010) suggest that there may be a possible fault, with a surface position within the far east of the Proposed Power Plant Site. It should be noted that fault positions have not been accurately located and could comprise a fault zone, which could result in disturbed ground, weaker rock or a deeper weathering profile.

12.4.41 Monitoring of groundwater wells installed during the Strata Surveys ground investigation (Strata Surveys, 2012) conducted in July and August 2012 suggests that the depth to groundwater may be approximately 7 m to 8 m bgl.

Potential Pollutant Linkages

12.4.42 In order for an area of potential contamination identified within the confines of the Site to pose a significant level of risk to the Proposed Development or the wider environment, a potential source and sensitive target or receptor has to be identified, together with a plausible and effective pathway by which the receptor may be exposed to any given hazard.

12.4.43 Based upon the available information, potential sources of contamination within the Site include:

- the coal stockyard and associated activities, including impacted soil and groundwater as identified by the Strata Surveys 2012 investigation;
- contamination associated with the coal stockyard machinery (stacker-reclaimer);
- the railway loop surrounding the coal stockyard;
- the existing coal-fired power station's effluent system, including oil-water interceptors;
- on-site pollution incidents identified as having a minor impact to land;
- historical contamination, including ground gas generation, related to the sand and gravel pits which are inferred to have been infilled prior to construction of the Proposed Development; and
- historical agricultural land use (*e.g.* use of pesticides, heavy equipment).

12.4.44 Based upon the available information, potential sources of contamination outside the Site (typically within 500 m of the Site, unless otherwise specified) include:

- permitted activities relating to the Site's continued operation as a power station, including contaminants associated with the main power plant from the boiler house, turbine house, substation etc.;
- the FGD plant and associated substances and processes;
- fuel oil storage tanks;
- contamination associated with storing and handling of PFA, including the 'ash pit';
- sewage works, located north-east of the Proposed Construction Laydown area;
- nearby glass manufacturing facility, located approximately 100 m south of the Proposed Power Plant Site and adjacent to the southern Proposed Borehole Water Connection;
- former Lytag plant to the east of the Proposed Power Plant Site, including pipeline formerly used to transport materials from the Site;
- nearby depot/ works, located approximately 600 m to the south of the Proposed Power Plant Site;
- a railway line (Knottingley to Goole), located approximately 750 m south of the Proposed Power Plant Site;
- a railway line (the East Coast Main Line) located approximately 250 m north of the Proposed Gas Connection;
- nearby historical landfill sites;
- nearby water works to the east and west of the Site;
- nearby registered waste treatment facility which accepts non-biodegradable wastes;

- historical contamination, including ground gas generation, related to numerous former sand and gravel pits in the vicinity of the site;
- offsite pollution incidents located within 500 m of the Site having a minor to significant impacts on air, land and water; and
- historical agricultural land use (e.g. use of pesticides, heavy equipment).

Potential Contaminants of Concern

12.4.45 Potential compounds of concern associated with the identified potential sources of contamination may include, but are not limited to:

- Volatile Organic Compounds (VOCs), including benzene, toluene, ethylbenzene and xylene (BTEX);
- Semi Volatile Organic Compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs);
- Total petroleum hydrocarbons (TPH);
- Polychlorinated Biphenyls (PCBs);
- heavy metals;
- asbestos;
- inorganic ions, including alkalinity and sulphate; and
- ground gases (carbon dioxide, methane, hydrogen sulphide etc.).

Potential Receptors

12.4.46 Based upon the available information, the following are considered to be potential receptors:

- human health –
 - current site employees,
 - offsite employees on neighbouring sites,
 - residential neighbours (nearest dwellings are approximately 300 m east of the Proposed Power Plant Site); and
 - future onsite and offsite employees;
- controlled waters –
 - shallow groundwater within the superficial deposits (Secondary A Aquifer),
 - deeper groundwater within the bedrock (Principal Aquifer), and
 - surface water, including Ings and Tetherings Drain and the River Aire, assumed to be in hydraulic continuity with the shallow groundwater;
- infrastructure –
 - below-ground structures, e.g. concrete foundations, plastic water pipes, and
 - confined spaces within buildings (e.g. basements, store cupboards, service ducts); and
- ecology –
 - flora and fauna in woodlands surrounding the Site.

Potential Pathways

12.4.47 Based upon the available information, the following are considered potential pathways:

- human health –
 - dermal contact with substances in shallow soil and/or shallow groundwater,
 - inhalation of substances in dust,
 - inhalation of vapours from soil and/or shallow groundwater, and
 - accidental ingestion of soil/dust and/or shallow groundwater during potential groundworks;
- controlled waters –
 - vertical migration through unsurfaced areas, vegetated areas and hard-standing (where there are joins/ cracks) and drains/pipework into the Made Ground/ shallow soil,
 - lateral and vertical migration within the Made Ground and superficial deposits, *e.g.* leaching from soils in the unsaturated zone into shallow groundwater,
 - preferential lateral and vertical migration along routes of underground services, pipelines and associated trenches (including granular backfilling materials),
 - lateral and vertical migration within shallow groundwater in the Made Ground/superficial deposits, including to deeper groundwater,
 - lateral and vertical migration within deeper groundwater in the bedrock, and
 - lateral migration within groundwater to surface water courses;
- infrastructure –
 - direct contact of substances within shallow groundwater with concrete foundations, plastic water pipes etc., and
 - migration of ground gases and accumulation in confined spaces (*e.g.* basements, service ducts); and
- ecology –
 - plant uptake and subsequent ingestion by fauna.

12.4.48 Environmental receptors identified in the conceptual site model for the current operation of the existing coal-fired power station site (*i.e.* baseline conditions) are summarised in Table 12.12 below.

Table 12.12: Summary of baseline receptors and sensitivity

| Receptor | Sensitivity | Assumptions |
|-----------------------------------|-------------|--|
| On-site workers | Low | Assumes correct use of suitable PPE and compliance with site operating procedures. |
| Construction / excavation workers | Medium | Assumes correct use of suitable PPE, compliance with procedures minimising exposure. |

| Receptor | Sensitivity | Assumptions |
|--|-------------|---|
| Off-site residents | Low | Initial high sensitivity reduced to low based on distance from site to neighbouring residents and assuming site operations are conducted according to agreed protocols, guidance and legislation, and no spillages or releases occur. |
| Groundwater (Principal Sherwood Sandstone Aquifer) | High | May be reduced to medium assuming normal site operations, no spills or releases and correct operation of site drainage. |
| On-site and off-site flora and fauna | Medium | Assuming normal site operations with no spills or releases and adherence to site guidance and protocols during operations |
| Off-site agricultural land | Medium | Proposed Gas Corridor |

Future Baseline

- 12.4.49 In the event that the Proposed Development does not proceed, no significant changes to the existing baseline assumed for the Proposed Development are anticipated.

12.5 Development Design and Impact Avoidance

- 12.5.1 The following impact avoidance measures would either be incorporated into the design or are standard demolition, construction and operational practices. These measures have therefore been taken into account during the impact assessment in Section 12.6. Any need for additional mitigation measures as identified as a result of the impact assessment are described (where necessary) in Section 12.7.

Possible Foundation Solutions

- 12.5.2 Depending on structural loading and settlement tolerances, based on the known ground conditions at the Proposed Power Plant Site, foundations may comprise shallow pads/ rafts or piles.
- 12.5.3 It is likely that some of the more sensitive structures of the Proposed Development, including the stacks, turbine blocks and cooling towers will require piled foundations. In addition, a temporary cofferdam (involving sheet piling) will be required during the construction works at the Proposed Cooling Water Connection abstraction and discharge points.

Construction

- 12.5.4 The appointed contractor(s) will (in due course) be required to produce a Construction Environmental Management Plan (CEMP) that will provide details of proposed environmental control measures, including measures related to the protection of land quality. The CEMP will include the impact avoidance measures as outlined in this section. A Framework CEMP has been prepared as part of this ES to support the DCO application (Appendix 5A, ES Volume III).
- 12.5.5 During construction of the Proposed Development the Contractor(s) will be required to minimise adverse land contamination effects on sensitive receptors by implementing good operational practices (e.g. employing suitable surface water drainage control).

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- 12.5.6 Construction workers will be protected from contact with hazardous materials by adopting appropriate health and safety measures including an assessment of appropriate measures under the Control of Substances Hazardous to Health (COSHH) Regulations 2002. Such measures will include suitable personal protective equipment, hygiene facilities and the implementation of dust control where considered necessary.
- 12.5.7 With regards to earthworks, the Contractor(s) will ensure that all material is suitable for its proposed use and will not result in an increase in contamination-related risks on identified receptors including any landscaped areas and underlying groundwater. Any material moved onto or off the site will need to comply with a Materials Management Plan to ensure that all materials are suitable for the proposed end use.
- 12.5.8 The main potential source of oils and fuels on site is from plant and machinery. All plant and machinery will be checked regularly and, where possible, the use of drip trays will be employed, should vehicles be parked on unsurfaced areas of the site. An emergency spillage action plan will be produced and provisions made to contain any leak/spill.
- 12.5.9 Given the historical land use within the areas of the Site within the existing coal-fired power station, there is a potential for contamination to be encountered locally within excavations. The Contractor(s) will be required to implement pollution control measures to deal with any contaminated land encountered during the construction works. These measures will include, as a minimum, the following:
- all workers will be required to wear PPE as applicable;
 - should any potentially contaminated ground, including isolated 'hotspots' of contamination, be encountered during construction, the Contractor(s) will be required to investigate the area and then assess whether there is a need for containment or disposal of the material. The Contractor(s) will also be required to assess whether any additional health and safety measures are required. Any such investigations will be required to be undertaken in consultation with the Environment Agency and other appropriate consultees. To further minimise the risks of contaminants being mobilised and contaminating other soils or water, construction workers will be briefed as to the possibility of the presence of such materials;
 - in the event that contamination is identified during construction works, appropriate remediation measures will be taken to protect construction workers, future site users, water resources, structures and services;
 - the Contractor(s) will be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water will be directed away from stockpiles to prevent erosion;
 - the risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works will be further reduced by implementing suitable measures including sealing stockpiles to prevent rainwater infiltration. Alternatively bunding and/or temporary drainage systems will be put in place, designed in line with current good practice, following appropriate guidelines and obtaining all relevant licences including discharge consents;
 - any waters removed from excavations by dewatering will be discharged appropriately, subject to the relevant licences being obtained; and
 - the Contractor(s) will implement a dust suppression/management system in order to control the potential risk from airborne contamination migrating off-site to adjacent sites, specifically the adjacent agricultural land, surrounding villages and the River Aire.

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- 12.5.10 A refurbishment/ demolition asbestos survey has been undertaken in 2016 to determine the risks associated with potential ACMs. Should any unconfirmed ACMs be encountered during the construction phase (such as within infilled ground/ Made Ground), associated works will be undertaken in accordance with the Control of Asbestos Regulations 2012, which includes measures set to safeguard human health and the environment.
- 12.5.11 Foundations and services will be designed and constructed to prevent the creation of pathways for the migration of contaminants and be constructed of materials that are suitable for the ground conditions and designed use, for example water supply pipes will be designed in accordance with current good practice and applicable guidance to ensure pipes are protected from potential impacts associated with any contamination.
- 12.5.12 Piling design and construction works will be completed following preparation of a piling risk assessment, completed in accordance with the Environment Agency's 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention' (Environment Agency, 2001).
- 12.5.13 A site-specific (Phase 2) intrusive ground investigation will be undertaken prior to the commencement of construction works. The Phase 2 ground investigation will be designed in order to:
- further investigate potential ground contamination associated with the previous land uses;
 - assess the potential for contamination to have migrated on-site from the adjacent land uses;
 - assess the potential risks associated with ground and mine gases;
 - include testing of soils with respect to contamination (including asbestos) for a subsequent risk assessment and identify potential options for reuse of the soils;
 - inform foundation design and remove uncertainty in ground conditions at the stack locations and at the Proposed Power Plant Site; and
 - better understand the ground conditions across the Proposed Power Plant Site, including variations in bedrock profile, the presence of geological faulting and the certainty of geology as critical structure locations.
- 12.5.14 Continued settlement monitoring of the ground surface across the Proposed Power Plant Site is considered necessary in order to confirm that longwall mining settlement has ceased.
- 12.5.15 Following completion of such an investigation, the need for any mitigation measures additional to the impact avoidance measures as presented above would be defined.

Operation

- 12.5.16 Liquid fuel storage areas and transformer building areas will be appropriately bunded to ensure that, in the event of any spillage, the materials are safely contained. Most significant impacts to soil and groundwater can be avoided with good housekeeping and management practices adopted and adhered to. However, cumulative emissions of oil based materials from road vehicles are more difficult to manage. Oil/ water separators will be installed as appropriate within the drainage system to reduce the likelihood of oil-based materials impacting on the environment.

12.6 Likely Impacts and Effects

Construction Impacts

12.6.1 Potential impacts during the construction phase (including demolition of structures within the Site) are anticipated to include the following:

- the discovery of soils exhibiting visual and olfactory evidence of contamination during groundworks and the potential disturbance of residual soil contamination through construction activities such as the removal of existing site drainage;
- the discovery of impacted groundwater/ surface water recovered during dewatering which may not be suitable for discharge without treatment;
- foundation methods and construction activities (including construction of cofferdams in the River Aire) that may open and/ or modify potential pollutant linkages, including the disturbance of sediments from existing drainage channels and the lagoon;
- re-profiling of the site including the possible introduction of new fill materials and the removal of unsuitable materials;
- runoff from contaminated material exposed and/ or stockpiled during site construction works;
- contamination arising from spillages associated with vehicles and construction materials;
- airborne contamination arising from potentially contaminated dust;
- removal of any waste materials and/ or contaminated soil; and
- introduction of contaminated materials during infilling activities.

Operation Impacts

12.6.2 Potential impacts during the operational phase are anticipated to include the following:

- leaks, spills and contamination from storage of chemicals, fuels and wastes on site affecting site users and groundwater; and
- presence of gases, vapours and groundwater in the ground affecting site users and buildings.

Decommissioning Impacts

12.6.3 Potential impacts during the decommissioning phase are anticipated to include the following:

- generation of wastes during decommissioning of existing chemical tanks, pipework, and associated infrastructure;
- generation of crushed concrete and other demolition materials;
- the discovery of soils exhibiting visual and olfactory evidence of contamination during demolition and the potential disturbance of residual soil contamination through demolition activities such as the removal of existing site drainage;
- the discovery of impacted groundwater recovered during removal of below ground structures (assuming these will be removed);
- demolition activities that may open and/ or modify potential pollutant linkages, including the disturbance of sediments;
- re-profiling of the site including the removal of unsuitable materials;
- runoff from contaminated material exposed and/ or stockpiled during site demolition works;

- contamination arising from spillages associated with vehicles and demolition materials;
- airborne contamination arising from potentially contaminated dust;
- removal of any waste materials and/ or contaminated soil; and
- introduction of contaminated materials during infilling activities.

Effects

12.6.4 It is concluded that, with the implementation of the impact avoidance measures and best practice guidance defined within Section 12.5, there is a low likelihood of the identified sensitive receptors being impacted upon by the Proposed Development throughout the construction, operation and decommissioning phases, as described in Table 12.13 below.

Table 12.13: Summary of impacts and effects

| Description of impact | Mitigating factors | Sensitivity of resource/receptor | Magnitude of impact | Classification of effect |
|---|--|----------------------------------|---------------------|--|
| Impact to construction workers from contaminated soils, sediments and groundwater / surface water encountered during construction | Depth to groundwater anticipated to be below proposed depth of construction. PPE requirements and engineering controls to be determined following groundwater monitoring as part of the future site investigation. | Medium | Low | Minor adverse (not significant) |
| Impact to groundwater from runoff and/or leachates from stockpiled materials during construction | Limited made ground anticipated to be encountered during earthworks. Mitigation measures to be adopted including collection of runoff and /or covering of stockpiles. | High | Very low | Minor adverse (not significant) |
| Impact to groundwater through creation of new or exacerbation of existing pathways during construction | Potential for residual sources of contamination (assuming removal of coal carpet) likely to be very limited. Additional mitigation (<i>e.g.</i> piling risk assessment) will further reduce hazard. | High | Very low | Minor adverse (not significant) |
| Impacts to flora, fauna and agricultural land from contaminated soils encountered during construction | Contaminated soils anticipated to be restricted to the Proposed Power Plant Site, away from agricultural land. | Medium | Low | Minor adverse (not significant) |

| Description of impact | Mitigating factors | Sensitivity of resource/receptor | Magnitude of impact | Classification of effect |
|---|--|----------------------------------|---------------------|---|
| Impact to workers, offsite residents and land from potentially contaminated dusts generated during construction | Adoption of suitable mitigation measures to minimise dust generation (e.g. damping down of materials). | Medium | Low | Minor adverse (not significant) |
| Risks to underlying groundwater potential contamination in imported fill placed at the Site. | Imported fill to be suitable for use, and subject to testing and visual inspection prior to acceptance at the Site. | Medium | Low | Minor adverse (not significant) |
| Impact to groundwater from spills, leachates and runoff during site operation | All fuel and chemical storage areas to be bunded Design of surface water drainage to include oil-water separator and sediment traps. | Medium | Low | Minor adverse (not significant) |
| Impacts to buildings and site workers from gases, vapours and groundwater during operation | Risks to be minimised through completion of site investigation and adoption of design measures and engineering controls to minimise risks. | Low | Low | Negligible adverse (not significant) |

12.7 Mitigation and Enhancement Measures

- 12.7.1 As no significant effects have been identified, no additional mitigation measures are required in order to further reduce the potential impacts and effects from the ground conditions on the Proposed Development.
- 12.7.2 Following completion of a ground investigation in due course, it will be possible to define the need for any additional mitigation measures further to the impacts avoidance measures detailed in Section 12.5.

12.8 Limitations or Difficulties

Assumptions

- 12.8.1 The identification of possible future receptors is based on the Proposed Development indicative concept design. Detailed method statements and/ or work plans for the construction activities at the Site are not available as a Contractor has not yet been appointed, however it is considered reasonable to assume that proposed demolition and construction activities will follow industry best practice and relevant guidance and comply with current applicable legislation, and that standard construction techniques will be used.

Limitations

- 12.8.2 Previous site investigations conducted within the existing power station site were typically focussed on the operational coal-fired power station and the western half of the coal stockyard. Little site investigation data was available for the eastern half of the Proposed Power Plant Site, and no data was available for the Proposed Cooling Water and Gas Connection corridors. The absence of data for these parts of the Proposed Development is considered to represent a data gap, and there may be ground conditions or contamination present within these areas which could not be included in the current assessment. However further site investigation will be undertaken prior to construction to enable appropriate mitigation and design measures to avoid significant adverse effects.

12.9 Residual Effects and Conclusions

- 12.9.1 Based on the information as detailed herein, the construction, operation and decommissioning activities proposed at the Site would have the potential to generate a number of land contamination related adverse effects on identified receptors if appropriate impacts avoidance measures as detailed in Section 12.5 are not implemented.
- 12.9.2 Assuming that the impact avoidance measures detailed in Section 12.5 are employed and any further mitigation measures identified following an appropriately designed ground investigation are implemented, the significance of effects related to potential geological, hydrogeological and contamination related impacts associated with the Proposed Development during the construction, operation and decommissioning phases are likely to be negligible or minor adverse, and therefore not significant for EIA purposes.

12.10 References

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