9 GEOLOGY, HYDROGEOLOGY AND CONTAMINATION

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES):

- presents the existing environmental baseline condition established from desk studies and consultation;
- presents the potential environmental effects on geology, hydrogeology and ground conditions arising from the proposed development with consideration of the contamination status of the site to key receptors, i.e. human health and controlled waters, based on the information gathered and the analysis and assessments undertaken;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

9.2 Assessment Methodology

Legislation and Planning Policy Context

Legislation

9.2.1 The principal legislative drivers for conserving sites of geological importance, protecting groundwater and managing risks to human health and the environment from historic land contamination are:

- European Water Framework Directive 2000 (2000/60/EC);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- The Groundwater Daughter Directive 2006; (2006/118/EC);
- Groundwater (England and Wales) Regulations 2009;
- The Water Resources Act 1991 (as amended 2009);
- The Water Act 2003;
- The Environment Act 1995;
- Environmental Liability Directive 2004 (2004/35/EC);
- Environmental Protection Act (EPA) 1990 (as amended);
- Contaminated Land (England) Regulations 2006 (as amended);
- Environmental Permitting (England and Wales) Regulations 2016 (as amended); and
- Wildlife and Countryside Act 1981 (as amended) (in terms of sites designated for their geological interest).
- The Town and Country Planning Act 1990 (as amended).

9.2.2 The Water Resources Act (1991 as amended) principally relates to the protection of controlled waters (i.e. rivers, lakes, canals and groundwater) from pollution. It sets out the responsibilities of the Environment Agency in relation to the water pollution, resource management, flood defence, fisheries and in some areas, navigation. It also regulates discharge to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater.

9.2.3 The Groundwater (England and Wales) Regulations (2009) supplement existing regulations to protect groundwater in England and Wales. These regulations control groundwater pollution from contaminated land. The regulations provide a more flexible, risk-based approach than previous legislation and cover a wider range of substance.

9.2.4 The Environmental Permitting (England and Wales) Regulations 2016 (as amended) introduced a new streamline system of environmental permitting in England and Wales for certain installations, waste operations, mobile plant and discharges to groundwater.

9.2.5 The Environment Act 1995 (Section 57) amends the Environmental Protection Act (1990) and makes provisions for a risk-based framework for identification, assessment and management of contaminated land within the UK. It includes measures for protection of the environment, including power to prevent water pollution.

9.2.6 Part 2A of the Environmental Protection Act is implemented by the Contaminated Land Regulations 2006 and the Contaminated Land (Amendment) Regulations 2012. The Part 2A regime is aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk that considers the 'contaminant-pathway-receptor' scenario (contaminant linkage). A source, pathway and receptor must be present to complete the pollutant linkage and for a potentially significant risk to exist.

National Planning Policy

9.2.7 The UK planning approach to the management of land contamination is risk-based and is implemented by the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2019). The NPPF sets out how planning policies and decisions should contribute to and enhance the natural and local environment.

9.2.8 The MHCLG has also produced National Planning Practice Guidance, which includes guidance on how land affected by contamination is dealt with through the planning regime. 'Land affected by contamination' was last updated in 2014 and provides advice on the information that should be provided to local authorities to demonstrate the risk posed by contaminated land.

Local Planning Policy

9.2.9 The Redcar and Cleveland Local Plan was adopted in 2018. There are a number of policies relating to the geological environment and development of brownfield land.

9.2.10 Sustainability and design Policy **SD4** relating to development in general, states that '*Development proposals will be expected to: respect or enhance the landscape,* [and] *geological features…*', whilst Natural Environment Policy **N1** states that '*Any development which is acceptable will be required to be designed and sited so as to cause no harm to the special character of the Heritage Coast, in particular… the geological value...*'

9.2.11 Local Spatial Policy **LS4** relating to the South Tees Redcar former steelworks area states that '*The council and its partners will aim to secure decontamination and redevelopment of potentially contaminated land … and enhance the environmental quality of the River Tees and coastline.*'

9.2.12 With reference to Natrual Environment Policy **N4** relating to developments in proximity to important sites, the plan states that *'It is important to consider biodiversity and geodiversity at the design stage, including where development is on brownfield land. Areas of biodiversity on brownfield land*

should be retained and enhanced alongside any remediation of contamination, where possible. Development which impacts detrimentally on biodiversity and geodiversity should be avoided, and will only be allowed in accordance with the above policy.'

Relevant Guidance

9.2.13 This assessment has been completed in accordance with the following national guidance and accepted industry good practice:

- British Standard BS10175 Investigation of Potentially Contaminated Sites (BSI, 2011 and amended 2017);
- Model Procedures for the Management of Land Contamination (CLR11) (Defra and the Environment Agency, 2004 (soon to be withdrawn and replaced by Land Contamination: Risk Management (LCRM));
- Construction Industry Research and Information Association (CIRIA) 132 (1996): A Guide for Safe Working on Contaminated Sites;
- CIRIA C552: Contaminated Land Risk Assessment - A Guide to Good Practice (CIRA, 2001);
- CIRIA 73: Role and Responsibility in Site Investigation (CIRIA, 1991);
- CIRIA Document C665 : Assessing Risks Posed by Hazardous Ground Gases to Buildings CIRIA (2007);
- British Standard requirements for the 'Code of practice for ground investigations' (ref. BS5930:2015);
- British Standard requirements for the 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' (ref BS8485:2015+A1:2019); and
- Defra Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012).

Study Area

9.2.14 The study area for this topic comprises the Application Site and a data search buffer of up to 1km. This enables the identification of both on-site and off-site potential sources of contaminants of concern and the underlying geology and hydrogeology, which may have influenced site conditions.

9.2.15 For some geological/ground conditions features and historical land uses a narrower buffer of 500 metres was used as impacts are most likely to occur within this distance. These features are identified below:

- geology (comprising artificial ground, superficial deposits and bedrock geology);
- environmental permits, incidents and registers;
- landfills and waste management sites;
- current and historical land use;
- mineral extraction sites;
- designated sites of geological conservation importance; and
- natural hazards (natural ground subsidence, shrink-swell hazard, compressible ground hazard)

9.2.16 For some receptors such as potable groundwater abstractions, the study area is extended to a distance of 2km.

Baseline Methodology

9.2.17 The baseline conditions have been informed by the Phase 1 Preliminary Environmental Risk Assessment (see Appendix 9.1).

9.2.18 The Phase 1 Preliminary Risk Assessment (Appendix 9.1) is primarily based on available information in relation to the geology, hydrogeology and ground conditions at the Application Site, with reference to data provided by Groundsure (an environmental information service provider). The Groundsure report includes information supplied by the following sources:

- Environment Agency ;
- Redcar and Cleveland Borough Council;
- British Geological Survey (BGS);
- Ordnance Survey (OS);
- Natural England; and
- Public Health England.

9.2.19 The Phase 1 Preliminary Risk Assessment (Appendix 9.1) includes a review of historical and current land uses to assess the potential for ground contamination; a review of the environmental setting to assess the sensitivity of the surrounding area to contamination/pollution; a qualitative environmental risk assessment of the Application Site's proposed use including the preparation of an outline Conceptual Site Model (CSM) detailing potential pollutant linkages associated with the proposed development.

9.2.20 A site visit was also undertaken on 14 June 2019 as part of the wider RPS assessment. Observations from the visit were used to characterise the geology, hydrogeology and contamination baseline where appropriate.

9.2.21 The methodology for the assessment of baseline conditions at the Application Site follows the phased approach presented in the Contaminated Land Report (CLR) 11 (EA, 2004). The baseline characterisation of the Application Site enables the development of a CSM, which identifies the existing ground conditions using the source-pathway-receptor pollutant linkage approach:

- source: referring to the potential source of contamination;
- pathway: the mechanism by which a contaminant could move/migrate to a receptor; and
- receptor: identified features that could be affected by a contaminant, based on the sensitivity of the site.

9.2.22 The outline CSM examines these elements for the Application Site in its current form and use. Following this approach, the likelihood of contamination to exist is based on all of these elements being present and forming a pollutant linkage.

9.2.23 The objective of this assessment is to align the contaminated land assessment process with the environmental impact assessment process. This involves considering how the impacts of construction and operation affect the elements of the pollutant linkage and if the impacts change the likelihood of the pollutant linkage becoming active.

Consultation

9.2.24 The majority of the consultation was undertaken through the environmental information service provider's report.

9.2.25 A summary of additional consultation with stakeholders or consultees (such as the local planning authority) is provided in Table 9.1 .

Table 9.1: Consultation Responses Relevant to Geology, Hydrogeology and Contamination

Date	Consultee and Issues Raised	How/ Where Addressed
May 2020 (Scoping response)	**Redcar and Cleveland Borough Council.** ***Contaminated Land and Statutory Nuisance*** No objections to the scoping proposal were raised.	Noted
May 2020 (Scoping response)	**Natural England**. The EIA will need to consider any impacts upon local wildlife and geological sites. Local sites are identified by the local wildlife trust or geoconservation group. They are of county importance for wildlife or geodiversity. The ES should therefore include an assessment of the likely impacts on wildlife or geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures.	

Assessment Criteria and Assignment of Significance

9.2.26 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and the magnitude of potential impacts.

Receptor Sensitivity/Value

9.2.27 The outline CSM developed as part of the Phase 1 Preliminary Risk Assessment (Appendix 9.1) identifies the key receptors and pathways of the pollutant linkages. The EIA process assigns a sensitivity/value to these receptors. The sensitivity (or value) considers the importance of the receptor, the use of the receptor and its ability to recover from damage. The receptors considered in this assessment are:

- construction workers (during construction phase);
- off-site users (during construction phase);
- future site users (during operational phase);
- maintenance workers (during operational phase);
- off-site users (during operational phase);
- sub surface infrastructure (during operational phase;
- superficial deposits and bedrock geology underlying the Application Site; and -
- designated geological sites.

9.2.28 The sensitivity/value of the identified receptors is defined in Table 9.2 **Error! Not a valid bookmark self-reference.** below.

Table 9.2: Sensitivity or Value Criteria

Sensitivity	Typical Descriptors	Example Receptors
Very High	Receptor is very high value or critical importance to local, regional or national economy. Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long term or not possible.	• construction workers; • future site users (including maintenance workers); • Principal aquifer providing regionally important potable abstractions; • Groundwater Source Protection Zones 1 and 2.
High	Receptor is of high value with reasonable contribution to local, regional or national economy. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly (e.g. remedial measures to groundwater may be required to prevent a wider impact).	• off-site users (during construction phase); • off-site site users (post development); • Principal aquifer providing locally important potable resource • nationally designated geological sites; • Groundwater Source Protection Zone 3
Medium	Receptor is of medium value with small levels of contribution to local, regional or national economy. Receptor is somewhat vulnerable to impacts that may arise from the project and has moderate to high levels of recoverability (e.g. up to 5 years for groundwater to return to its current or an improved condition).	• Secondary A aquifer unit providing water for agricultural or industrial use; • sub-surface infrastructure; • regionally important geological sites
Low	Receptor is of low value with little contribution to local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability (e.g. up to 1 year before groundwater returns to its current or improved condition).	• Secondary Undifferentiated Aquifer or Secondary B Aquifer unit providing industrial use; • tidally influenced groundwater.
Negligible	Receptor is of negligible value with no contribution to local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability.	• Unproductive strata.

Magnitude of Impact

9.2.29 The likely impacts of the construction and operation of the proposed development in terms of geology, hydrogeology and ground conditions have been defined as follows in Table 9.3:

Table 9.3: Magnitude of Impact Criteria

Magnitude of Impact	Typical Descriptors	
	Adverse	**Beneficial**
High	Severe loss of resource and/or quality and integrity of resource; damage to key characteristics, features or elements, of permanent or long-term duration (i.e. greater than 5 years).	Large scale or major permanent improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.

Magnitude of Impact	Typical Descriptors Adverse	Beneficial
Medium	Loss of resource, not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements, and of medium-term duration (i.e. less than 5 years).	Short or medium-term benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements and of short-term duration (i.e. up to 1 year).	Minor short-term benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements, and of short-term duration (i.e. up to 1 year).	Very minor temporary benefit to or positive addition of one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

Significance of Effects

9.2.30 The significance of predicted effects likely to occur during the construction and operational phases of the proposed development have been determined by considering the sensitivity of the receptors that may be affected and the magnitude of the predicted impact.

9.2.31 Where more than one significance level is provided within the table, professional judgement has been used to determine the likely significance of effect.

Table 9.4: Assessment Matrix

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very high	No change	Minor	Moderate or Major	Major or Substantial	Substantial

9.2.32 Explanations of significance criteria used within the assessment are set out below. In accordance with the EIA regulations, only effects of moderate or greater are considered to be significant.

- **Substantial:** Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- **Major:** These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. For example, major adverse effects could include: the potential to result in major harm to human health; a reduction of

water quality rendering groundwater unfit to drink; reduced reliability of supply at a groundwater abstraction source; a permanent or severe temporary reduction in the quality of a Principal Aquifer; or a severe or localised permanent reduction in the quality of any classified groundwater. A major beneficial effect could include: major improvement to human health; or a major improvement at local or regional scale in the quality of potable groundwater.

- **Moderate:** These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor. For example, moderate adverse effects could include: the potential for moderate temporary or minor chronic harm to human health; or a severe temporary or localised permanent reduction in the quality of any classified groundwater. A moderate beneficial effect could include: a moderate improvement in human health; or a moderate improvement at local or regional scale in the quality of any classified groundwater.
- **Minor:** These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project. For example, minor adverse effects could include: the potential for temporary slight/minor harm to human health; localised reduction in the quality of any classified groundwater which would be fully reversible with time or widespread reversible reduction in the quality of groundwater used only for commercial or industrial abstractions. A minor beneficial effect could include: slight improvement in human health (or slight reduction in existing human health risk factors; a minor local scale improvement in the quality of any classified groundwater and/or a moderate or notable improvement in the quality of groundwater resources used only for commercial or industrial abstraction.
- **Negligible:** No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- **No Change:** No adverse or beneficial impact.

Limitations of the Assessment

9.2.33 The baseline conditions were identified by a desktop review of relevant data sets undertaken as part of the Phase 1 Preliminary Risk Assessment (see Appendix 9.1). The baseline characterisation is considered adequate and robust to inform the assessment for the purpose of the ES. An intrusive site investigation would be undertaken post consent to inform the detailed design of foundations and to investigate the presence of soil and groundwater contamination Based on the findings of the site investigation the outline CSM (in Appendix 9.1) would be updated accordingly and any unacceptable risks to receptors would be subject to mitigation or remediation. The absence of the investigation results is considered unlikely to change the conclusions of the assessment.

9.3 Baseline Environment

9.3.1 This section provides a summary of information about the site presented within the RPS Phase 1 Preliminary Risk Assessment report.

Current and Historical Land Use

9.3.2 The Application Site is located approximately 4.5 km west of Redcar town centre and 8.5km north east of Middlesbrough town centre. The site forms part of the demise of Redcar Bulk Terminal and occupies an area of approximately 10.1 hectares of what was heavily industrialised land. Redcar

Bulk Terminal is a port used for the transhipment of coal and coke and other bulk goods, and for many years was the import dock for iron ore.

9.3.3 The site is open in character with a small area used for the storage of bulk materials such as coal scrapings. In addition, there are a number of small corrugated metal buildings located on the eastern part of the site. At the time of the site visit in June 2019 there were a number of temporary cabins, lorries, trailers and skips present on the Application Site.

9.3.4 A review of historical maps indicates that the Application Site and much of the surrounding area was reclaimed from the Tees Estuary circa 1950 with the Redcar Jetty and associated Tramway crossing the southern extent of the Application Site since prior to 1893. There is evidence of earthworks from 1952 (likely to be associated with the reclamation process) and is identified as a Spoil Tip on maps dated 1967-1969.

9.3.5 The earliest maps to show structures on the Application Site (other than the Jetty and the Tramway) is dated 1980. This shows railway lines and conveyors on the Application Site and tanks on adjacent land to the east. The site is labelled as Teesside Works Redcar and is considered likely to have been part of the adjacent steelworks (now closed).A series of aerial photographs dating from 1999 suggest that the Application Site was used for the storage of material associated with the Steel Works during 1999 (possibly linear steel products) with a compound in the eastern extent which appears to contain small buildings, skips and containers. Later aerial photographs suggest that the majority of the Application Site was vacant apart from the compound area, which was extended, and contained further skips; possibly with areas of stockpiled materials/waste.

9.3.6 Off-site historical potential sources of contaminants include Made Ground (associated with land reclamation, spoil tipping, railway land), tanks, pipelines and other processes associated with the steelworks.

Published Geological Mapping and Records

9.3.7 Based on British Geological Survey (BGS) mapping (1:50,000-scale) and the Environment Agency Groundwater Vulnerability mapping (1:100,000-scale), the stratigraphic sequence and aquifer classifications beneath the Application Site are indicated to be as follows:

Table 9.5: Descriptions of Geological Strata

Strata	Description and Approximate Thickness	Aquifer Classification
Artificial Ground	Associated with reclamation of the Application Site from the foreshore. Anecdotal information suggests that use of steelworks waste for the reclamation which is likely to consist of slag and other foundry waste material. Approximate depth of 5 metres below ground level (bgl). (unproven at this stage)	N/A
Tidal Flat Deposits	Sand and silt. Possibly up to 12 metres in depth (unproven at this stage)	Secondary Undifferentiated Aquifer
Mercia Mudstone Group	Dominantly red, occasionally green-grey mudstone and siltstone. Considerable depth.	Secondary B Aquifer

9.3.8 Based on the BGS Historic Borehole index, (a map of historic boreholes) shows that there are no records of boreholes on the Application Site, however there are three records within 250 metres, including two boreholes at BGS ref: NZ52NE52 and NZ52NE54. The boreholes appear to have been drilled in the 1970s, ground levels at 7.04 metres and 2.53 metres above ordnance datum (AOD) respectively, following the tipping of spoil in the general area identified on historic mapping. A general stratigraphic sequence represented by these records is summarised in Table 9.6 below:

Table 9.6: Descriptions of Geological Strata – BGS Borehole Logs

Description	Strata	Approximate Depth (m AOD)	Approximate Thickness (m)
Cobble sized SLAG.	Made Ground	From ground level to 0.44	1.00 to 6.60
Light brown slightly gravelly fine to medium SAND with occasional shell fragments. Gravel is rounded and fine.	Tidal Flat Deposits	From 0.44 to -13.00	11.50 to 13.00
Stiff reddish-brown mottled grey silty slightly gravelly CLAY. Gravel is rub-rounded to sub-angular, fine to medium.	Glacial Till	From 13.00 to -14.00	1.50 to 3.50
Weak reddish-brown MUDSTONE. Highly, becoming moderately, weathered red brown, closely fractured, with thin bands of very weak greenish grey siltstone.	Mercia Mudstone	From 14.00	Unproven

9.3.9 Borehole records and geological and historical mapping indicate that Made Ground is present across the Application Site. It is associated with tipping of waste material from the steelworks as part of the reclamation works to raise land levels. The nature and thickness of the Made Ground present on the Application Site is not known.

Hydrogeology

9.3.10 The Tidal Flat Deposits underlying the Application Site are classified by the Environment Agency as a Secondary Undifferentiated Aquifer. These aquifer units have variable characteristics and it is not possible to attribute them to Secondary A or Secondary B categories. .

9.3.11 The underlying Mercia Mudstone Group is classified as a Secondary B Aquifer. These formations are generally formed of lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

9.3.12 Information provided by the Environment Agency indicates that there are no records of active licensed groundwater abstractions within 2km of the Application Site, and the site is not located in a Groundwater Source Protection Zone (SPZ).

9.3.13 Under the Water Framework Directive, the Environment Agency's local River Basin Management Plan (Northumbrian River Basin Management Plan, Environment Agency 2015) classified groundwater chemical quality beneath the site as 'Poor' quality in 2015.

Environmentally Important Sites

9.3.14 The Application Site is located adjacent to the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI); which is located beyond the site's northern boundary.

9.3.15 The Teesmouth and Cleveland Coast SSSI is designated owing to several nationally important features including Jurassic geology, Quaternary Geology, sand dunes, saltmarshes and various biological features including breeding harbour seals, a wide range of breeding and non-breeding birds and a diverse assemblage of invertebrates associated with sand dunes.

9.3.16 The Application Site is also located 448 metres from the Redcar Rocks SSSI, which overlaps with the Teesmouth and Cleveland Coast SSSI. This SSSI is designated for its geological importance. Information provided by Natural England states:

9.3.17 *'Redcar Rocks represent the finest exposures of rock in the Lower Lias north of the Market Weighton Swell i.e. in the Yorkshire Basin. They display most of the stratigraphical interval missing*

from classic sections along the Yorkshire coast and are composed of calcareous shales containing characteristic fossil ammonites. These span both Hettangian and Sinemurian Stages and are thus of key importance in relation to better known sections in Yorkshire. This rock sequence is atypical of the Lower Lias since, elsewhere in Britain, Blue Lias faces are normally found. When exposed at low tide the rocks and sands provide an important feeding ground for several species of wading birds.'

9.3.18 Redcar Rocks SSSI is considered to be too distant from the Application Site to be affected by the proposed development and is not considered further in this assessment.

9.3.19 The Application Site is located approximately 78 metres south east of the Teesmouth and Cleveland Coast Special Protection Area (SPA), a habitat for rare and migratory birds. This area is also designated as a proposed Ramsar site due to its international importance as a wetland. The SPA and Ramsar designations largely overlap with Teesmouth and Cleveland Coast SSSI boundary and therefore, impacts on these sites are assessed as part of the SSSI assessment.

Coal Mining

9.3.20 The Interactive Map Viewer on the Coal Authority website indicates that the Application Site is not located in a coal mining reporting area.

Non-Coal Mining

9.3.21 There are no records of non-coal mining or other mineral extractions within 1km of the Application Site.

Landfills and Waste Sites

9.3.22 Information provided by the data sources set out in paragraph 9.2.18 shows that there is one recorded licensed landfill site within 250 metres of the Application Site (see Table 9.7).

Table 9.7: Landfill / Waste Transfer / Waste Treatment Sites

Source of Record	Approx. Distance and Direction	Licence Details	Waste Type and Details
Environment Agency	433 metres East	Site Ref: 0700/CLE/087 Issue: 11/12/1979 Surrender: 13/04/1997	Landfill. Inert, Industrial EPR Ref: YP1/L/BRI012

9.3.23 Historical mapping indicates that the Application Site has been reclaimed from the foreshore and some maps identify the site as a spoil tip. Anecdotal information suggests that steelworks waste in the form of slag was tipped onto the Application Site during the reclamation process.

9.3.24 The Groundsure report identifies several surface ground workings within 250 metres of the Application Site including a refuse heap (on site – assumed to represent the spoil tip identified by historical mapping); sand pit (78 metres north east); unspecified pit (104 metres north east); refuse heap (114 metres west and 232 metres east) and multiple unspecified ground workings.

Environmental Permits

9.3.25 Data from the Environment Agency and Redcar & Cleveland Borough Council indicates that there are three processes regulated by an Environmental Permit (under the Environmental Permitting Regulations 2010, as amended) within 500 metres of the Application Site. These are outlined in Table 9.8.

Table 9.8: Environmental Permits

Licence Holder	Approx. Distance and Direction from Site	Permitted Activity
British Steel Corporation Waste Management licence No: 68638 Issue: 19/07/1993 Expired: 01/04/1996	390 metres East	Industrial Waste Landfill (Factory curtilage) 25,000 tonnes EPR Licence: BRI002 EPR reference: RP3793NV/A001
BRITISH STEEL LIMITED Installation Name: TEESSIDE BEAM MILL Issue: 21/04/2017 Effective: 31/01/2020	409 metres South east	Associated process Permit: QP3735JT EPR reference: VP3839DA
Corus Construction Waste Management licence No: 60141 Issue: 12/01/1983 Surrendered: 29/11/2018	449 metres West	Industrial Waste Landfill (Factory curtilage) 25000 tonnes EPR Licence: BRI001 EPR reference: TP3390ZV/S002

COMAH Sites

9.3.26 The Application Site is currently located within an operational COMAH facility. This relates to South Teesside Company Limited, a COMAH Upper Tier Operator.

Pollution Incidents

9.3.27 Environment Agency data indicates that there are no records of 'major' or 'significant' pollution incidents within 500 metres of the Application Site.

Ground Stability

9.3.28 Information provided by the BGS indicates that the Application Site is at very low or negligible risk of natural land stability associated with shrink swell clays, running sands, compressible deposits, collapsible deposits, landslides and ground dissolution.

9.3.29 Ground stability associated with the Made Ground and underlying natural deposits would be assessed as part of the detailed site investigation prior to redevelopment of the site.

Future Baseline Conditions

9.3.30 Whilst sea level change associated with climate change may result in a rise in groundwater levels this is unlikely to have a significant impact on baseline conditions from a ground conditions perspective in relation to the proposed development.

9.4 Mitigation Measures Adopted as Part of the Project

Construction Phase

9.4.1 The construction phase would be carried out in accordance with the measures outlined in the Code of Construction Practice (CoCP) that would be prepared post consent and agreed with Redcar & Cleveland Borough Council prior to the commencement of construction.

9.4.2 Measures to be included within the CoCP would include those consistent with current industry good practice for construction. As a minimum, the Undertaker would ensure that the statutory

obligations under environment, health and safety legislation are fulfilled. Measures would include the following:

- the implementation of dust suppression measures in accordance with guidance provided by the Institute of Air Quality Management e.g. dampening/sheeting of stockpiles and exposed soils;
- the provision of appropriate working practices and personal protective equipment (PPE) for construction workers and provision of guidance regarding high levels of personal hygiene;
- a site investigation to confirm the presence/absence of soil and groundwater contamination and ground gas as well as general ground conditions to inform geotechnical design. The scope of the investigation would be confirmed with the Environment Agency and/or Redbridge & Clevelenad Borough Council;
- where the results of the site investigation determine that remediation is required to ensure that the site is suitable for its proposed use, a remediation strategy would be prepared and the scope would be agreed with Environment Agency and/or Redbridge & Clevelenad Borough Council. The remediation strategy would identify and prescribe appropriate mitigation / remediation requirements to manage the risk associated with ground contamination to all identified receptors during the operational phase;
- on completion of the mitigation/remediation works, a validation report would be prepared with testing to confirm that contaminants in soil and groundwater and ground gas levels (as appropriate) are at acceptable levels and that design measures for remdiation/mitigation have been appropriately installed;
- site personnel would be given training to detect any unusual visual or odorous characteristics of soils and groundwater which could indicate the presence of previously unknown contamination. Should any previously unidentified contamination be detected at the site during the construction phase,
- a procedure to manage any previously unidentified contaminated soils or groundwater that are encountered (e.g. work in the area would temporarily cease. A suitability qualified environmental consultant would attend site to advise on an appropriate course of action. Details of the conditions encountered would be reported to Local Authority and the Environment Agency, and a suitable risk assessment and management strategy for dealing with the contamination would be submitted for approval by the Local Authority;
- imported soils, if required, for use would be subject to tetsing to ensure suitable for use for the landscaping areas;
- appropriate storage and hadling of potentially polluting materials and chemicals in accordance with the Control of Pollution (Oil Storage) Regulations, 2001,eg providing a secondary containment system with a capacity of at least 110% of the storage tank capacity and the base and walls of the containment system to be impermeable;
- any areas for the storage of bulk materials including oils, fuels and chemicals would be sited away from the northern boundary of the Application Site. Storage areas would be bunded to minimise the risk of substances entering the drainage system. Storage areas would be managed according to current best practice and in compliance with prevailing legislation and Environment Agency guidance;
- no substances or liquids would be discharged to ground without the prior approval of the Environment Agency; and
- leaks or spillages of potentially polluting substances would be contained, collected then removed from site in an appropriate manner, e.g. use of absorbent material, bunding or

booms. An emergency action plan would be formulated which all site personnel would be required to read and understand.

9.4.3 The implementation of suitable measures in line with the Construction Design Management Regulations (2015) would manage the risks posed to human health during the construction phase.

Operational Phase

9.4.4 The operation of the REC would be managed through an Environmental Permit and therefore, no additional mitigation measures are considered necessary.

9.5 Assessment of Construction Effects

During Construction

Impacts on Human Health – Construction Workers

9.5.1 The historical land uses identified on and near the Application Site represent potential sources of ground contamination. There is the potential for associated contamination to be mobilised as a result of general ground disturbance, earthworks, establishment of haul routes and removal of vegetation, etc as part of the construction phase. This can create active pathways relating to direct dermal contact, ingestion or dust inhalation relevant to construction workers.

9.5.2 Soil and groundwater contamination associated with historical land uses would be identified through a site investigation and the results would be subject to a risk assessment. The risk assessment would indicate whether shallow surface soils contain levels of contamination that may represent a potential risk to future site users based on its proposed end-use. Any unacceptable risk to human health or controlled waters receptors would be subject to remediation or mitigation prior to or during redevelopment as set out in the remediation strategy. This would include appropriate gas protection within the buildings based on the results of ground gas monitoring.

9.5.3 Foreseeable impacts during the construction process would be managed as part of the CoCP. This would also include a contingency in the event that there are spills/leaks or previously unidentified contamination is encountered.

9.5.4 Impacts on human health as a result of changes to ground conditions during construction phase would be preventable, short-term, and limited to construction workers. Construction workers are considered to be very highly sensitive. With the implementation the mitigation measures set out in section 9.4, the magnitude of impact would be negligible.

9.5.5 On this basis, the level of effect is considered to be minor adverse, which is not significant.

Impacts on Human Health – Off-Site Users

9.5.6 The potential sources of contamination are the same as described above. The potential source-pathway-receptor linkage would be limited to two pathways: airborne migration of soil/dust from the Application Site, and the migration off-site via groundwater in the Tidal Flat Deposits and Mercia Mudstone Group.. Construction phase mitigation measures would be in accordance with the CoCP , in particular dust suppression methods and appropriate storage of polluting chemicals.

9.5.7 Migration via groundwater offsite would be limited by the relatively low permeability of the underlying aquifers, however cohesive layers within the strata may represent a preferential pathway for the lateral migration of contaminants off the Application Site.

9.5.8 The impacts on human health as a result of migration of contaminants (if present) from the Application Site during the construction phase would be limited, short-term, and of local spatial

extent (i.e. only adjacent land users). Off-site users are considered to be highly sensitive. With the implementation of the mitigation measures, in particular the dust control measures, the magnitude of impact would be negligible.

9.5.9 On this basis, the level of effect is considered to be minor adverse, which is not significant.

Impacts on Groundwater

9.5.10 There is a potential for contaminants (if present) within shallow soils to mobilise into the underlying Secondary Undifferentiated Aquifer (Tidal Flat Deposits) and the Secondary B Aquifer (Mercia Mudstone Group) as a result of exposed ground, ground disturbance, general earthworks, and construction of building foundations, etc. There is also the potential for contamination of soils and groundwater from the use, storage or spillage of construction related chemicals (fuels, oil, cement, etc).

9.5.11 Some foundation works, piling works and deep earthworks have the potential to generate preferential pathways for the vertical and lateral migration of contaminants within the shallow soils or any shallow groundwater.

9.5.12 The impacts on groundwater as a result of leaching and migration of contaminants on the site would be long-term, reversible, and of local spatial extent. With the implementation of pre-construction phase mitigation measures, in particular site investigation and remediation (where required) to manage the risk to controlled waters receptors, the magnitude of any impact could be reduced to low.

9.5.13 Groundwater within the Tidal Flat Deposits and Mercia Mudstone Group is the receptor and is considered to have limited sensitivity based on the aquifer classifications, poor quality and absence of sensitive abstractions.

9.5.14 The site is not located in a Groundwater Source Protection Zone and is in an area of currently poor chemical groundwater quality. The groundwater on site is therefore, considered to be low to sensitivity and the magnitude of impact is considered to be low.

9.5.15 On this the basis, the level of effect is considered to be minor adverse, which is not significant.

Impacts on the Teesmouth and Cleveland Coast SSSI

9.5.16 The Teesmouth and Cleveland Coast SSSI is located adjacent to the Application Site's northern boundary and is considered to be a highly sensitive receptor.

9.5.17 In order to protect the SSSI during the construction phase, measures would be set out within the CoCP to mitigate the impacts. Measures may include establishing a no-works buffer to prevent physical damage to the SSSI from construction machinery and storage of equipment and materials.

9.5.18 Similarly, measures would be implemented to ensure that surface water runoff is not allowed to discharge to the SSSI.

9.5.19 Excavations within the Tidal Flat Deposits may encounter groundwater which is likely to be in direct connectivity and within the tidal influence of the River Tees Estuary and associated SSSI. During such excavations any construction related chemicals would be stored away from the excavation to minimise the potential for any spills/leaks to impact the SSSI.

9.5.20 The impact on the Teesmouth and Cleveland Coast SSSI as a result of run-off and increased surface infiltration / through flow of shallow groundwater during construction would be preventable, short-term, and of local spatial extent. With the implementation of the mitigation measures, in particular the site investigation and remediation (where required) and measures included within the CoCP to prevent surface water run-off, the magnitude of impact would be negligible.

9.5.21 On this basis, the level of effect is considered to be minor adverse, which is not significant.

End of Construction

Impacts on Human Health – Future Site Users (including maintenance workers)

9.5.22 At the end of the construction process, the implementation of the remediation/mitigation measures (as set out in the remediation strategy) would be completed. A validation report would be prepared including soil, groundwater and gas testing (as appropriate) to confirm that contaminants are at acceptable levels and that remediation/mitigation measures have been appropriately installed. The majority of the Application Site would be occupied by buildings or hardstanding that would block any potential pathways, mitigating the risk of exposure to shallow soils and groundwater for future site users through dermal contact or ingestion.

9.5.23 Future site users are considered to have a very high sensitivity.

9.5.24 The magnitude of impact to future site users as a result of the implementation of any remediation / mitigation required and the addition of hardstanding/building cover would be up to medium beneficial depending on the degree of existing contamination and the nature of the remediation / mitigation incorporated into the proposed development.

9.5.25 On this basis, the level of effect is considered to be up to moderate beneficial, which is significant.

Impacts on Human Health – Off-Site Users

9.5.26 At present, much of the Application Site's surface area exists as bare ground. This may allow a degree airborne mobilisation of surface soil contaminants. On completion of the proposed development, any contamination that represents a unacceptable risk to receptors would have been remediated or controlled through mitigation and much of the Application Site would be covered by low permeability hardstanding which would prevent the mobilisation of any residual shallow soil contaminants via airborne migration, thereby reducing the risk to off-site receptors.

9.5.27 The increased building cover and hardstanding of the proposed development is also likely to result in an increase in rainfall surface water run-off, however with the appropriately designed drainage system (see Appendix 8,XX) there would be a reduction in the overall exposure of on-site soils to rainfall, limiting the infiltration of shallow perched groundwater to mobilise any remaining potential contaminants off-site.

9.5.28 Off-site users are considered to have a high sensitivity.

9.5.29 The impacts to future off site users as a result of the implementation of any remediation / mitigation required and the addition of hardstanding/building cover would be up to low beneficial depending on the degree of existing contamination and the nature of the remediation / mitigation incorporated into the development.

9.5.30 On this basis, the level of effect is considered to be up to minor beneficial, which is not significant.

Impacts on Groundwater

9.5.31 As described above, the net overall effect of the proposed development is likely to reduce infiltration to shallow groundwater, through increased building cover, hardstanding and drainage. The presence of Tidal Flat Deposits would reduce vertical migration in these areas to the more sensitive underlying Secondary B Aquifer of the Mercia Mudstone Formation. The groundwater within the aquifer units is considered to be of low sensitivity.

9.5.32 The implementation of mitigation measures and a remediation scheme where required, and the outline drainage strategy (Appendix 8.XX) would reduce the potential for surface water to infiltrate into areas of potentially contaminated ground. This would prevent any further mobilisation of contamination to groundwater.

9.5.33 The impacts to groundwater as a result of the implementation of any remediation / mitigation required and the addition of hardstanding/building cover would be up to medium beneficial depending on the degree of existing contamination and the nature of the remediation / mitigation incorporated into the proposed development.

9.5.34 On this basis, the level of effect is considered to be up to minor beneficial, which is not significant.

Impacts on Sub-surface infrastructure

9.5.35 The potential impacts to sub surface infrastructure include impacts associated with ground gas, sulphate attack on buried concrete and contaminants permeating water supply pipes.

9.5.36 These potential impacts would be included as part of the site investigation and mitigation would be adopted through the remediation strategy (eg. gas protection measures, specialist concrete and the use of 'lined 'barrier pipe' and trenches backfilled with clean inert material for new utilities).

9.5.37 The sub-surface infrastructure is considered to represent a medium sensitivity receptor. On the basis the appropriate mitigation is adopted the magnitude of effects will be no change. Therefore, the level of effect is also no change.

Future Monitoring

9.5.38 If the site investigation identifies soil or groundwater contamination that represents a potential risk to receptors, future monitoring may be recommended as part of the remediation strategy This may be implemented in addition to remediation / mitigation measures where considered of value.

Accidents and/or Disasters

9.5.39 The implementation of the measures within the CoCP incorporating an outline spillage response plan, appropriate storage of potentially polluting materials and chemicals and dust suppression methods, would limit the potential for accidental spillages and leaks during the construction phase.

9.6 Assessment of Operational Effects

Impacts on Human Health – Future Site Users

9.6.1 The REC involves the processing and storage of mixed municipal solid wastes, commercial and industrial waste, and/or refuse derived fuel. There would also be energy recovery and incinerator bottom ash recycling facilities. There is the potential for contaminant pathways to be active where waste and process materials are not managed appropriately.

9.6.2 On site users are considered to have a very high sensitivity.

9.6.3 The operation of the REC, including the storage of the waste materials to be processed and the chemicals used in the process, would be regulated through the Environmental Permit. On this basis, the magnitude of impact would be negligible, and the level of effect is considered to be minor adverse, which is not significant.

Impacts on Groundwater

9.6.4 There is the potential for contaminated surface runoff to be generated by the operation of the REC, in particular, from the IBA storage facility, and without appropriate management this could infiltrate into the ground and affect groundwater. The sensitivity of the groundwater underlying the Application Site is low.

9.6.5 Drainage from the operational areas of the REC would be contained and managed on site. The operation of the REC would be in accordance with the measures set out in the Environmental Permit. This would limit the potential for any harmful contaminants associated with the waste materials to migrate to groundwater. The magnitude of impact would be negligible, and the level of effect is considered to be negligible, which is not significant.

Impacts on the Teesmouth and Cleveland SSSI

9.6.6 During operation, there is the potential for the release of contaminants from the REC (particularly emissions and contaminated runoff) to affect the adjacent SSSI. The sensitivity of the SSSI is high.

9.6.7 The operation of the REC would be regulated by an Environmental Permit which would include procedures and measures to control emissions and runoff and avoid the accidental release of contaminants. On this basis, the magnitude of impact would be negligible, and the level of effect is considered to be minor adverse, which is not significant.

Further Mitigation

9.6.8 No further mitigation is likely to be required once the project is operational.

Future Monitoring

9.6.9 The site's Environmental Permit may include a requirement to routinely monitoring soil and groundwater quality on a pre-determined timeline. This would be agreed as part of the Permit application process.

Accidents/Disasters

9.6.10 The site's Environmental Permit would include any necessary accident/disaster mitigation/planning requirements for the operational phase.

Potential Changes to the Assessment as a Result of Climate Change

9.6.11 Whilst sea level change associated with climate change may result in a rise in groundwater levels this is unlikely to have a significant impact on the assessment from a ground conditions perspective in relation to the proposed development.

9.7 Assessment of Decommissioning Effects

9.7.1 Predicted effects on geology, hydrogeology and contamination during the decommissioning of the proposed development would be equivalent to those in the construction phase. The decommissioning of the proposed development is not anticipated to cause any significant effects on human health, groundwater or the Teesmouth and Cleveland SSSI.

9.8 Assessment of Cumulative Effects

9.8.1 The assessment of cumulative effects considers the impacts associated with the REC together with other developments and plans. The developments and plans selected as relevant to the cumulative assessment presented within this chapter are based upon the cumulative screening exercise described in Chapter 4 (Environmental Assessment Methodology) and Appendix 4.XX). Details of the projects considered in the cumulative assessment in this chapter are provided in Table 9.9 below.

Table 9.9: Cumulative Developments considered in the Assessment of Effects on Geology, Hydrogeology and contamination

Ref	Cumulative development	Distance from the site	Potential effects
7	York Potash Port and Materials Handling Facilities R/2015/0218/DCO R/2015/0218/DCO R/2014/0626/FFM, R/2014/0627/FFM DCO made 20/07/16	681 metres	No cumulative effects on human health, groundwater, nationally designated geological sites or sub surface infrastructure are envisaged due to the distance of the development from the Application Site.
15	Net Zero Teeside Project: Cluster Carbon Capture and Usage ttps://infrastructure.planninginspectorate.gov.uk/projects/north-east/the-net-zero-teesside-project/?ipcsection=docs Scoping direction issued 02/04/19	951 metres (some of the associated infrastructure is shown to be on and adjacent to the Application Site)	Potential cumulative effects on human health, groundwater and national designated sites from the infrastructure located on and adjacent to the Application Site)

Cumulative Effects – Human Health

9.8.2 The planning process for the proposed Tees Cluster Carbon Capture and Usage facility would involve a risk assessment of the potential for contamination on the main site and along the route of its associated infrastructure, and mitigation/remediation would be implemented (where appropriate) to reduce the potential impacts to on site and off-site receptors. Similarly, a site investigation and remediation/mitigation would be undertaken on the Application Site. On this basis, cumulative effects of the proposed Tees Cluster Carbon Capture and Usage with the REC would not be significant.

Cumulative Effects - Groundwater

9.8.3 The groundwater underlying the Application Site is of low sensitivity. There is the potential for lateral and vertical migration of contaminants on the Application Site as a result of construction activities associated with the REC and the infrastructure of the Tees Cluster Carbon Capture and Usage facility. However, existing contamination would be identified and remediated as appropriate prior to construction. Measures within the CoCP would also minimise potential impacts to

groundwater from spills and leakages during the construction process. On this basis, cumulative effects of the proposed Tees Cluster Carbon Capture and Usage with the REC would not be significant.

Cumulative Effects - Teesmouth and Cleveland Coast SSSI

9.8.4 The infrastructure associated with the proposed Tees Cluster Carbon Capture and Usage facility is also located within the Teesmouth and Cleveland Coast SSSI. The construction of the REC does not require land take from the SSSI and measures would be put in place during the construction of the REC to avoid or minimise impacts to the SSSI. Therefore, it is not considered that the proposed redevelopment would contribute to any significant cumulative effects on the SSSI.

9.9 Inter-relationships

9.9.1 There are inter-relationships between geology, hydrogeology and contamination and other topics within the ES. These include synergies with hydrology and flood risk and to some extent, with ecology and ornithology where the geology and groundwater influence important habitats.

9.9.2 There is the potential that any soils or groundwater contamination present on the Application Site could impact surface water receptors which are considered as part of Chapter 8(Hydrology and Flood Risk). It is standard practice that site investigations assess the risk to all relevant controlled waters receptor including groundwater and nearby surface waters. Therefore, the impacts to the Tees Estuary would be assessed as part of the proposed site investigation and any unacceptable risk would be managed through remediating or mitigation as defined within a remediation strategy.

9.10 Summary of Effects

9.10.1 The Application Site is underlain by Made Ground to a depth of approximately 6 metres associated with reclamation of the site and surrounding area of the Tees Estuary. The superficial geology is indicated to comprise of Tidal Flat Deposits which are classified as a Secondary Undifferentiated Aquifer. The underlying bedrock is indicated to consist of the Mercia Mudstone group which extends to considerable thickness and is classified as a Secondary B Aquifer.

9.10.2 The Teesmouth and Cleveland Coast SSSI which is designated due to its geological and biological importance is located adjacent to the site.

9.10.3 The Application Site has been subject to a Phase 1 Preliminary Risk Assessment (Appendix 9.1). It identified the potential for soil and groundwater contamination to be present on the Application Site as a result of past uses including reclamation of land from the Tees Estuary by raising land levels using imported materials and spoil tipping. The Phase 1 Preliminary Risk Assessment also identified the potential for ground gas to impact the Application Site.

9.10.4 A site investigation would be undertaken post consent to inform the foundation design and to investigate potential contaminants as identified by the Phase 1 Preliminary Risk Assessment (Appendix 9.1). Subject to the results of the investigation a remediation strategy would be prepared. The scope of the investigation and the remediation strategy would be agreed with the Environment Agency and/or Redcar & Cleveland Borough Council. On completion of the remediation, a validation report would be prepared to confirm that the remediation/mitigation measures had implemented.

9.10.5 A CoCP would be developed post consent and implemented during the construction phase to mitigate the potential impacts to identified receptors during the construction phases.

9.10.6 On the basis of the above, the construction phase impacts are short-term and of local spatial extent; the magnitude of impact would be negligible to low and the significance of effects are considered to be minor adverse, which is not significant.

9.10.7 At the end of the construction phase, the effects to future site users as a result of the implementation of any remediation / mitigation required and the addition of hardstanding/building cover would be up to moderate beneficial depending on the degree of existing contamination and the nature of the remediation / mitigation incorporated into the development. The effect on off-site users and groundwater would be up to minor beneficial.

9.10.8 During the operational phase, the site would be regulated by an environmental permit agreed with the Environment Agency. Appropriate measures would be implemented and audited through the permit and the significance of the effect to future site users, groundwater and the adjacent SSSI would be negligible to minor adverse, which is not significant.

9.11 References

European Water Framework Directive 2000 (2000/60/EC)

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

The Groundwater Daughter Directive 2006; (2006/118/EC)

Groundwater (England and Wales) Regulations 2009

The Water Resources Act 1991 (as amended 2009)

The Water Act 2003

The Environment Act 1995

Environmental Liability Directive 2004 (2004/35/EC)

Environmental Protection Act (EPA) 1990 (as amended)

Contaminated Land (England) Regulations 2006 (as amended)

Environmental Permitting (England and Wales) Regulations 2016 (as amended)

Wildlife and Countryside Act 1981 (as amended) (in terms of sites designated for their geological interest)

The Town and Country Planning Act 1990 (as amended)

British Standard, 2015. Requirements for the 'Code of practice for ground investigations' BS5930; and

British Standard, 2015 and 2019. Requirements for the 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' BS8485

British Standard, 2017. Investigation of Potentially Contaminated Sites BS10175

Construction Industry Research and Information Association (CIRIA) 1991. Role and Responsibility in Site Investigation 73

CIRIA, 1996. A Guide for Safe Working on Contaminated Sites 132

CIRIA, 2001.Contaminated Land Risk Assessment - A Guide to Good Practice C552

CIRIA, 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings C665;

Department of Environment and Rural Affairs (Defra) and Environment Agency, 2004. Model Procedures for the Management of Land Contamination (CLR11)

Department for Communities and Local Government (DCLG) (2014 as amended) National Planning Practice Guidance (NPPG)

Ministry for Housing, Communities and Local Government (2019), National Planning Policy Framework (NPPF)

Redcar & Cleveland Bough Council, 2018. Local Plan

Table 9.10: Summary of Likely Environmental Effects on Geology and Contamination

Receptor	Sensitivity of receptor	Description of impact	Mitigation measure	Magnitude of impact	Significance of effect	Significant / Not significant
During Construction						
Human Health - Construction workers	Very High	Mobilisation of contaminants and dust, exposure to ground gas/vapours	CoCP, site investigation and H&S risk assessment. Use of PPE and dust mitigation, etc.	Negligible	Minor adverse	Not significant
Human Health – Adjacent site users	High	Mobilisation of contaminants and dust, exposure to ground gas/vapours	CoCP, site investigation, dust mitigation.	Negligible	Minor adverse	Not significant
Groundwater – Tidal Flat Deposits (Secondary Undifferentiated Aquifer) Mercia Mudstone (Secondary B Aquifer)	Low	Mobilisation of contaminants and leaching through groundwater. Spillages or leaks of chemicals	CoCP, site investigation. Soil/groundwater remediation and materials management.	Low	Minor adverse	Not significant
Teesmouth and Cleveland Coast SSSI	High	Direct damage to geology from construction activities, dust and release of contaminated run-off	CoCP, site investigation. Dust management and run-off control.	Negligible	Minor adverse	Not significant
End of Construction						
Human Health - Future site users	Very High	Mobilisation of contaminants and dust, exposure to ground gas/vapours	Validation report, gas protection measures within buildings, surface cover (buildings/ areas of hardstanding).	Up to Medium	Up to Moderate beneficial	Significant
Human Health – Adjacent site users	High	Mobilisation of contaminants and dust,	Validation report, surface cover	Up to Medium	Up to Minor beneficial	Not significant

Receptor	Sensitivity of receptor	Description of impact	Mitigation measure	Magnitude of impact	Significance of effect	Significant / Not significant
		exposure to ground gas/vapours				
Sub surface infrastructure	Medium	Damage to integrity of materials from soil contaminants	Validation report use of 'barrier pipe', etc.	No change	No change	Not significant
Groundwater	Low	Mobilisation of contaminants and leaching through groundwater. Spillages or leaks of chemicals	Validation report, surface cover (buildings/ areas of hardstanding).	Up to Medium	Up to Minor beneficial.	Not significant
Operational Phase						
Human Health – Future site users	Very High	Dermal exposure, vapours	Environmental permit	Negligible	Minor adverse	Not significant
Groundwater – Tidal Flat Deposits (Secondary Undifferentiated Aquifer) Mercia Mudstone (Secondary B Aquifer)	Low	Spillages or leaks of chemicals or waste water from IBA recycling facility	Environmental permit and drainage strategy	Negligible	Negligible	Not significant
Teesmouth and Cleveland Coast SSSI	High	Release of dust and contaminated run-off	Environmental permit and drainage strategy	Negligible	Minor adverse	Not significant