The Sizewell C Project

6.4 Volume 3 Northern Park and Ride

Chapter 11 Geology and Land Quality

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Contents

Tables

Plates

None provided.

Figures

None provided.

Appendices

11. Geology and Land Quality

11.1 Introduction

11.1.1 This chapter of **Volume 3** of the **Environmental Statement** (**ES**) (Doc Ref. 6.4) presents an assessment of the potential effects on geology and land quality arising from the construction, operation and removal and reinstatement phases of the northern park and ride site at Darsham (referred to throughout this volume as the 'proposed development'). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation, and the residual effects.

11.1.2 Detailed descriptions of the northern park and ride site (referred to throughout this volume as the 'site'), the proposed development and the different phases of development are provided in **Chapters 1** and **2** of this volume of the **ES**. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1, Appendix 1A** of the **ES**.

11.1.3 The Government's Good Practice Guide for Environmental Impact Assessment (EIA)[1] (Ref. 11.1) outlines the potential environmental effects that should be considered for geology and land quality e.g. physical effects of the development, effects on geology, and effects on contamination. Further information on these potential environmental effects and those which have been scoped into the geology and land quality assessment can be found in **Volume 1**, **Appendix 6N** of the **ES**.

11.1.4 This assessment has been informed by data from the following other assessments:

- **Chapter 10** of this volume: Soils and agriculture.
- **Chapter 12** of this volume: Groundwater and surface water.

11.1.5 This assessment has also been informed by data presented in the following technical appendices:

- **Appendix 11A** of this volume**:** Northern Park and Ride Site, Darsham: Phase 1 Desk Study Report.
- **Appendix 11B** of this volume**:** Conceptual site models.
- **Appendix 11C** of this volume: Impact assessment tables.

1 It should be noted that this document has been withdrawn; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents

11.2 Legislation, policy and guidance

11.2.1 **Volume 1, Appendix 6N** of the **ES** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential geology and land quality impacts associated with the Sizewell C Project across all **ES** volumes.

11.2.2 This section provides an overview of the legislation, policy and guidance specific to the assessment of the proposed development.

a) International

11.2.3 International legislation or policy relevant to the geology and land quality assessment includes the Water Framework Directive (WFD) 2000/60/EC (Ref. 11.2) and the Waste Framework Directive 2008 (Ref. 11.3). The requirements of these, as relevant to the geology and land quality assessment, are described in **Volume 1**, **Appendix 6N** of the **ES**.

b) National

11.2.4 National legislation relevant to the geology and land quality assessment includes:

- Part IIA of the Environmental Protection Act 1990 (Ref. 11.4).
- Water Resources Act 1991 (Ref. 11.5).
- The Control of Substances Hazardous to Human Health Regulations 2002 (Ref. 11.6).
- Construction (Design and Management) Regulations 2015 (Ref. 11.7).
- Waste Management Regulations 2016 (Ref. 11.8).
- Landfill (England and Wales) Regulations 2005 (Ref. 11.9).
- Hazardous Waste (England and Wales) Regulations 2005 (Ref. 11.10).
- The Environmental Permitting (England and Wales) Regulations 2016 (Ref.11.11).

11.2.5 The requirements of these, as relevant to the geology and land quality assessment, are described in **Volume 1, Appendix 6N** of the **ES**.

i. Planning Policies

11.2.6 National Policy Statements (NPS) set out national policy for energy infrastructure. The overarching NPS for Energy (NPS EN-1) (Ref. 11.12) and NPS for Nuclear Power Generation (NPS EN-6) (Ref. 11.13) provide the

primary policy framework within which the proposed development will be considered. The requirements of these, as relevant the geology and land quality assessment, are described in **Volume 1**, **Appendix 6N** of the **ES**.

11.2.7 Other national policies relevant to the geology and land quality assessment include the National Planning Policy Framework 2019 (Ref. 11.14), Planning Practice Guidance 2019 (Ref. 11.15) and the Government's 25 Year Environment Plan 2018 (Ref. 11.16). The requirements of these are described in **Volume 1**, **Appendix 6N** of the **ES**.

c) Regional

11.2.8 No regional policy is deemed relevant to the assessment of geology and land quality for this site.

d) Local

11.2.9 **Volume 1, Appendix 6N** of the **ES** summarises the requirements of Suffolk Coastal District Council (SCDC) Local Plan Core Strategy and Development Management Polices (Ref. 11.17), and Suffolk Coastal Local Plan (Ref. 11.18).

e) Guidance

11.2.10 Guidance relating to the geology and land quality assessment include:

- The Department for Environment, Food and Rural Affairs (Defra) Contaminated Land Statutory Guidance 2012 (Ref. 11.19).
- Contaminated Land Report (CLR) 11[2] (Ref. 11.20).
- Guiding Principles for Land Contamination (Ref. 11.21).
- The Definition of Waste: Development Industry Code of Practice (Ref. 11.22).
- The Design Manual for Roads and Bridges (DMRB) (2008) Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects (Ref. 11.23).
- DMRB (1993) Volume 11, Section 3, Part 11 Geology and Soils (Ref. 11.24).
- Department of the Environment (1995) Industry Profiles for previously developed land, Environment Agency (Ref. 11.25).

[2] It is noted that CLR11 is due to be withdrawn in early 2020 and replaced by updated online guidance: Environment Agency Land contamination: Risk Management (LCRM).

- Construction Industry Research and Information Association (CIRIA) C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice (Ref. 11.26).
- National House-Building Council and Environment Agency (2008) Guidance on the Safe Development of Housing on Land Affected by Contamination (R&D66) (Ref. 11.27).
- CIRIA C665 (2007) Assessing Risks Posed by Hazardous Ground Gases to Buildings (Ref. 11.28).
- British Standards (2015) BS 8485 +A1:2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (Ref. 11.29).
- CIRIA C681 (2009) Unexploded Ordnance (UXO) – A Guide for the Construction Industry (Ref. 11.30).
- CIRIA C733 (2014) Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (Ref. 11.31).
- CIRIA C682 (2009) The Volatile Organic Contaminants Handbook (Ref. 11.32).
- British Standards (2015) BS 5930 – Code of practice for ground investigations (Ref. 11.33); and
- British Standards (2017) BS 10175:2011+A2:2017 – Code of Practice for Investigation of Potentially Contaminated Sites (Ref. 11.34).

11.2.11 Further detail on this guidance, as relevant to the geology and land quality assessment is set out in **Volume 1, Appendix 6N** of the **ES**.

11.3 Methodology

a) Scope of the assessment

11.3.1 The generic EIA methodology is detailed in **Volume 1**, **Chapter 6** of the **ES**.

11.3.2 The full method of assessment for geology and land quality that has been applied for the Sizewell C Project is included in **Volume 1**, **Appendix 6N** of the **ES**.

11.3.3 This section provides specific details of the geology and land quality methodology applied to the assessment of the proposed development, and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of assessment considers the impacts of the construction, operation, and removal and reinstatement phases of the proposed development.

11.3.4 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate (PINS). A request for an EIA scoping opinion was initially issued to the PINS in 2014, with an updated request issued in 2019, see **Volume 1, Appendix 6A** of the **ES**.

11.3.5 Comments raised in the EIA scoping opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Volume 1, Appendices 6A** to **6C** of the **ES**.

11.3.6 The Government's Good Practice Guide for EIA[3] states that the following potential environmental effects should be considered for geology and land quality:

- physical effects of the development: such as changes in topography, soil compaction, soil erosion, ground stability etc.;
- effects on geology as a valuable resource: such as mineral resource sterilisation, loss or damage to regionally important geological sites, geological sites of special scientific interest (SSSIs) etc.;
- effects on soil as a valuable resource: such as loss or damage to soil of good agricultural quality;
- effects associated with ground contamination that may already exist on-site: such as introducing or changing pathways and receptors;
- effects associated with the potential for polluting substances used (during the various phases) to cause new ground contamination issues on-site, such as introducing or changing the source of contamination and, or pathways; and
- effects associated with re-use of soils and waste soils: such as re-use of site-sourced materials on or off-site, disposal of site-sourced materials off-site, importation of materials to the site etc.

11.3.7 The proposed development is considered unlikely to have an impact on important geological sites as no geological SSSIs or local geological sites have been identified within the study area (described in **section 11.3 c** of this chapter). However, given the comments in the revised scoping opinion received in 2019 in relation to the effects on geology as a valuable resource, an assessment of the effects on mineral resources has been included.

11.3.8 The proposed development would involve minor earthworks comprising levelling of the site in the south and the west, the removal of topsoil and potentially some limited subsoil, and excavations for pad foundations, road,

3 It should be noted that this document has been withdrawn; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents

drainage and services. Given existing ground conditions and the proposed works, the proposed development is considered unlikely to have an impact on soil compaction and ground stability. Physical effects in relation to changes in topography, including landscape fabric and character, are discussed in **Chapter 6** of this volume.

11.3.9 The effects on soil as a valuable resource are discussed in **Chapter 10** of this volume. Management of site-sourced waste materials, other than site soils (i.e. general waste materials from construction, operational and removal and reinstatement phases) is summarised in **Chapter 2** of this volume, with further details provided in the **Waste Management Strategy** in **Volume 2, Appendix 8A** of the **ES**.

11.3.10 Therefore, the following remaining environmental effects have been considered and form part of the assessment in this chapter:

- physical effects of soil erosion;
- mineral resource loss, damage or sterilisation;
- effects associated with existing ground contamination and potential new ground contamination issues; and
- effects associated with the re-use or disposal of site sourced soils and waste soils.

11.3.11 Potential impacts from existing and new contamination sources on controlled waters have been considered as part of the geology and land quality assessment, to determine and classify potential effects associated with ground contamination. Further description of the effects from contamination to groundwater and surface water is provided in **Chapter 12** of this volume.

11.3.12 This chapter provides an initial indication of chronic long-term risks to construction and maintenance workers. In accordance with the **Code of Construction Practice** (**CoCP**) (Doc Ref. 8.11), short-term acute risks should be assessed, managed and mitigated by the contractor with appropriate risk assessments and methods statements, and subsequent control measures.

b) Consultation

11.3.13 The scope of the assessment has also been informed by ongoing project-wide consultation and engagement with statutory consultees throughout the design and assessment process as outlined in **Volume 1, Appendix 6N** of the **ES**.

c) Study area

11.3.14 To consider the physical effects of the proposed development and the effects associated with mineral resources, the re-use of soils and waste soils, the study area is defined as the area within the site boundary. The site boundary of the proposed development is presented in **Figure 1.1,** of **Chapter 1,** of this volume.

11.3.15 The study area for the consideration of effects on human receptors, controlled waters, ecological receptors and property receptors includes the site and land immediately beyond it to a distance of 500 metres (m). This takes into account the transport and final destination of potential contaminants of concern in the environment, and the connectivity of these contaminants via pathways of migration or exposure to the receptors identified.

11.3.16 Based on the contaminated land desk study provided in **Appendix 11A** of this volume, this study area was considered sufficient for the assessment of the potential land contamination and associated potential contaminant linkages (PCL) risks as the land has previously undergone limited development, and as such contamination, if present, is likely to be limited in extent, or have a limited lateral mobility if present.

d) Assessment scenarios

11.3.17 The assessment of effects on geology and land quality includes the assessment of the construction, operational, and removal and reinstatement phases of the proposed development, rather than specific assessment years.

e) Assessment criteria

11.3.18 As described in **Volume 1**, **Chapter 6** of the **ES**, the EIA methodology considers whether impacts of the proposed development would have an effect on any resources or receptors. For physical effects and effects associated with mineral resources, waste soils, and soil re-use, the assessments broadly consider the magnitude of impacts and value or sensitivity of resources or receptors that could be affected in order to classify effects. For land contamination the assessment considers the change in the level of contaminative risks to the relevant receptors in order to classify effects.

11.3.19 A summary of the two assessment methods and assessment criteria used in the geology and land quality assessment is presented in the following sub-sections.

f) Physical effects and effects associated with mineral resources, waste soils, and soil re-use

11.3.20 An impact assessment of the potential physical effects of the proposed development on geology, and the effects associated with mineral resources, soils re-use, and waste soils has been undertaken using a qualitative approach which considers the effects of the construction, operational and removal and reinstatement phases of the proposed development.

g) Value/sensitivity

11.3.21 The value/sensitivity of a receptor is considered when determining the consequence of an effect in the impact assessment. Where the attribute falls within two value/sensitivity criteria, the worst case value/sensitivity is selected. The value/sensitivity of soil and geological receptors has been determined using the classifications given in **Table 11.1**.

Table 11.1: Criteria for classifying the value and/or sensitivity of environmental resources/receptors.

Value/ Sensitivity	Criteria	Description
High	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a very low capacity to accommodate the proposed change.	Regionally important mineral resource. Within a mineral safeguarding area. Major ground stability, soil compaction or erosion hazards currently present at the site. High potential for soils re-use.
Medium	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a low capacity to accommodate the proposed change.	Moderately economically viable mineral resource. Adjacent to a mineral safeguarding area. Moderate ground stability, soil compaction or erosion hazards currently present at the site. Moderate potential for soils re-use.
Low	Attribute only possesses characteristics which are locally significant. Attribute has some tolerance to accommodate the proposed change.	Low economically viable minerals. Low ground stability, soil compaction or erosion hazards currently present at the site. Limited opportunity for soils re-use.
Very low	Attribute characteristics do not make a significant contribution to local character or distinctiveness. Attribute is generally tolerant and can accommodate the proposed change.	No economically viable minerals. No ground stability, soil compaction or erosion hazards currently present at the site. No opportunity for soils re-use.

i. Magnitude

11.3.22 Following determination of the value/sensitivity of the receptors, the magnitude of potential impacts are determined. The criteria for the assessment of impact

magnitude for physical effects and effects associated with mineral resources, waste soils and soil re-use are defined in **Table 11.2**.

Table 11.2: Assessment of magnitude of impacts for physical effects and effects associated with mineral resources, waste soils and soil re-use.

Magnitude	Criteria
High	Total loss or major alterations to one or more of the key elements, features or characteristics of the baseline. The situation will be fundamentally different.
Medium	Partial loss or alteration to one or more of the key elements or characteristics of the baseline. The situation will be partially changed.
Low	Minor loss or alteration to one or more of the key elements, features or characteristics of the baseline. The change will be discernible but the underlying situation will remain similar to the baseline.
Very Low	Very minor loss or alteration to one or more of the key elements, features or characteristics of the baseline, such that the change will be barely discernible, approximating to the 'no change' situation.

ii. Effect definitions

11.3.23 The overall potential significance of physical effects and effects associated with mineral resources, waste soils, and soil re-use is defined using the matrix presented in **Table 11.3**, which describes the relationship between the value/sensitivity of the receptor as defined in **Table 11.1** and the magnitude (change) of the potential impact as defined in **Table 11.2**.

11.3.24 Following the classification of an effect as presented in **Table 11.3**, a clear statement is made in the assessment as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant, and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Table 11.3: Criteria for determining the significance of physical effects and effects associated with mineral resources, waste soils and soil re-use.

		Value/Sensitivity of Receptor			
		Very Low.	Low	Medium	High
Magnitude	Very Low.	Negligible	Negligible	Minor	Minor
	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

11.3.25 Physical effects, and effects associated with mineral resources, waste soils, and soil re-use are described as adverse/negative or beneficial/positive, considering the value of the receptor, area over which the impact may occur,

whether the impact is direct or indirect, the duration of the impact (short-term: under three years, medium-term: three to ten years or long-term: over ten years), and whether the impact is permanent or temporary.

11.3.26 The classifications of physical effects and effects associated with mineral resources, waste soils and soil re-use are described in **Table 11.4**.

Table 11.4: Classification of effects.

Classification	Effect
Major adverse.	Major sterilisation of mineral resources from either an active mining /quarrying site or mineral safeguarding area. Major soil erosion, soil compaction or ground instability that is permanent in nature. The generation of major volumes of soils classified as hazardous waste requiring off-site disposal.
Moderate adverse.	Moderate sterilisation of a mineral resource or mineral safeguarding area. Moderate soil erosion, soil compaction, or ground instability that is either permanent or long-term in nature. The generation of moderate volume of waste requiring off-site disposal.
Minor adverse.	Minor sterilisation of a mineral resource or mineral safeguarding area. Limited medium-term soil erosion, soil compaction, or ground instability. The generation of a minor amount of waste soil requiring off-site disposal.
Negligible.	No change to a mineral resource or mineral safeguarding area. No measurable impact on soil erosion, soil compaction, waste volumes, or ground instability or impacts that are only temporary in nature (less than three years). No change in contamination risks.
Minor beneficial.	Minor improvement in access to a mineral resource potentially facilitating future mineral extraction. Limited medium-term reduction in existing soil erosion, soil compaction, or ground instability issues. A minor amount of materials re-use on-site, thereby reducing off-site disposal volumes.
Moderate beneficial.	Moderate improvement in access to a mineral resource facilitating future mineral extraction. Moderate permanent or long-term reduction in existing soil erosion, soil compaction, or ground instability issues. A moderate amount of materials reuse as part of the development, thereby reducing off-site disposal volumes by a significant extent.
Major beneficial.	Major improvement in access to a mineral resource facilitating future mineral extraction. Major permanent reduction in existing soil erosion, soil compaction or ground instability issues. Sustainable reuse of materials on-site with no, or only minimal, off-site disposal of waste soils.

iii. Land contamination

11.3.27 The generic EIA methodology as described in **Volume 1, Chapter 6** of the **ES** is not used to consider the effects on land contamination from the proposed development. Instead, the assessment considers the risks to various receptors from land contamination, and the change in this risk profile during construction, operation, and removal and reinstatement. As such the magnitude of the impact is not determined, being replaced by the change in risk level to the various receptors, which is subsequently used to define the effect.

11.3.28 The assessment of the potential impacts of the proposed development on land contamination has been undertaken over two stages including:

- stage 1 – a land contamination risk assessment; and
- stage 2 – a land contamination impact assessment.

Stage 1 – Risk assessment

11.3.29 A Phase 1 Desk Study Report, provided in **Appendix 11A** of this volume, was prepared for the site which sets out the baseline environmental characteristics for the proposed development and study area. The baseline assessment was undertaken using existing data, publicly available information and historical records. This Phase 1 Desk Study Report also defines the preliminary conceptual site model (PCSM).

11.3.30 Based on the PCSM qualitative risk assessments have been undertaken in accordance with relevant guidance provided in **section 11.3** of this chapter, considering the potential sources, pathways and receptors present during the baseline, construction, operational and removal and reinstatement phases, and are included in **Appendix 11B** of this volume.

11.3.31 To assist in the risk assessment process by helping to determine the consequence of contamination being present, as provided in **section 11.3.32** of this chapter, a value/sensitivity has been assigned to each of the contaminated land receptors. The definition of each of these is given in **Table 11.5.**

Table 11.5: Assessment of the value or sensitivity of receptors associated with land contamination.

Value/ Sensitivity.	Criteria	Description
High	Attribute possesses key characteristics which contribute significantly to the	Principal aquifer providing potable water to a large population, within an inner or outer groundwater source protection zone (SPZ) (SPZ 1 or SPZ 2).

Value/ Sensitivity.	Criteria	Description
	distinctiveness, rarity and character of the site/receptor. Attribute has a very low capacity to accommodate the proposed change.	WFD high status water body (surface water) providing potable water to a small population. Sensitive human health receptors, for example young children/other users of residential areas, schools and parks. Buildings, including services and foundations but of high historic value or other sensitivity for example statutory historic designations, schools, residential dwellings. Ecological statutory designations with high sensitivity or international designations for example special area of conservation, special protection area, Ramsar etc. Crops and livestock with a high commercial / economic value.
Medium	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a low capacity to accommodate the proposed change.	Principal aquifer beyond an SPZ, secondary aquifer providing abstraction water for single private potable water supplies, agricultural or industrial use. WFD good status water body (surface water). Moderate sensitivity human health receptors, for example commercial/industrial users. Buildings and infrastructure of high regional value or high sensitivity for example schools, hospitals, residential dwellings. Ecological statutory designations with medium sensitivity or national designations for example SSSI, national nature reserve, area of outstanding natural beauty, marine conservation zone, etc. Local geological sites or regionally important geological sites. Crops and livestock with a medium commercial/economic value.
Low	Attribute only possesses characteristics which are locally significant. Attribute has some tolerance to accommodate the proposed change.	Secondary aquifer not currently used for groundwater abstraction. WFD moderate status (surface water). Less sensitive human health receptors, for example construction workers using mitigation measures. Buildings and infrastructure of local importance or low sensitivity (commercial / industrial buildings, main roads, railways). Ecological statutory designations with low sensitivity or sites with local designations for example local nature reserve. Crops and livestock with a low commercial/economic value.
Very low	Attribute characteristics do not make a significant	Non-productive strata (groundwater). WFD poor status (surface water). No sensitive human receptors.

Value/ Sensitivity.	Criteria	Description
	contribution to local character or distinctiveness. Attribute is generally tolerant and can accommodate the proposed change.	Locally important infrastructure (local roads, bridges, footpaths). Land with low sensitivity and/or non-statutory designations. No crop or livestock receptors.

11.3.32 The risk assessment then applies the principles given in the National House Building Council and Environment Agency report R&D66 and CIRIA C552, which provide guidance on the preparation and application of the consequence and probability matrix (as presented in **Table 11.6**) for contaminated land risk assessment.

11.3.33 The potential risk to a receptor is a function of the probability and the consequence of a PCL being realised. Probability (likelihood of an event occurring) takes into account both the presence of the hazard, and the receptor and the integrity of the exposure pathway. Consequence takes into account both the potential severity of the hazard, and the value/sensitivity of the receptor. Definitions of probability, consequence and the classified risks adopted for this assessment are detailed in **Volume 1**, **Appendix 6N** of the **ES**.

Table 11.6: Land quality estimation of the level of risk by comparison of consequence and probability.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very high risk.	High risk.	Moderate risk.	Moderate/low risk.
	Likely	High risk.	Moderate Risk.	Moderate/low risk.	Low risk.
	Low Likelihood	Moderate risk.	Moderate/low risk.	Low risk.	Very low risk.
	Unlikely	Moderate/low risk.	Low risk.	Very low risk.	Very low risk.

11.3.34 The descriptions of the classified risks and likely action required as given in R&D66 are detailed in **Volume 1**, **Appendix 6N** of the **ES**.

Stage 2 – Impact assessment

11.3.35 The impact assessment has been undertaken by comparing the baseline risk assessments with the construction, operation and removal and reinstatement phase risk assessments. This approach enables changes in the contaminated land status during the various phases to be identified and recorded.

Effect definitions

11.3.36 The effects of the proposed development are described as adverse/negative or beneficial/positive and major, moderate, minor or negligible on the basis of **Table 11.7**.

Table 11.7: Classification of effects.

Classification	Effect
Major adverse	An increase in contamination risk from the existing baseline conditions of four or five risk levels in the risk matrix, e.g. land that has a very low contamination risk in the baseline becomes a high or very high risk. Land that does not meet the statutory definition of contaminated land in the existing baseline becomes capable of being determined under Part IIA of the Environmental Protection Act 1990.
Moderate adverse	An increase in contamination risk from the existing baseline conditions of two or three risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk. Land that does not meet the statutory definition of contaminated land in the existing baseline becomes capable of being determined under Part IIA of the Environmental Protection Act 1990.
Minor adverse	An increase in contamination risk from the existing baseline conditions of one risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate to low risk.
Negligible	No change in contamination risks.
Minor beneficial	A reduction in contamination risk from the existing baseline conditions of one risk level in the risk matrix, e.g. land that has a moderate to low contamination risk in the baseline becomes a low risk.
Moderate beneficial	A reduction in contamination risk from the existing baseline conditions of two or three risk levels in the risk matrix, e.g. land that has a high contamination risk in the baseline becomes a moderate to low or low risk. Land that meets the statutory definition of contaminated land in the existing baseline is no longer capable of being determined under Part IIA of the Environmental Protection Act 1990.
Major beneficial	A reduction in contamination risk from the existing baseline conditions of four or five risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk. Land that meets the statutory definition of contaminated land in the existing baseline is no longer capable of being determined under Part IIA of the Environmental Protection Act 1990.

11.3.37 Following the classification of an effect as presented in **Table 11.7**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. Major and moderate effects are considered to be significant, and minor and negligible effects are considered to be not significant.

11.3.38 It should be noted that, given the information known at the time of writing, professional judgement has been applied in certain circumstances where the

introduction, or removal of a receptor, has automatically triggered a minor adverse or minor beneficial effect.

h) Assessment methodology

11.3.39 Detailed assessment methodologies for geology and land quality are presented in **Volume 1, Appendix 6N** of the **ES**. A summary is provided in the following sections.

i. General approach

11.3.40 The approach to the geology and land quality assessment comprises:

- establishing the baseline conditions for the study area with respect to geology, ground stability, hydrology, hydrogeology, contaminated land (including the potential for unexploded ordnance and ground gases) and historical uses;
- identification of potential impacts on identified resources and receptors from the construction, operation and removal and reinstatement phases of the proposed development;
- assessment of the significance of likely effects from the proposed development including the consideration of mitigation measures; and
- identification of any residual effects and secondary mitigation where required.

ii. Establishing the baseline

11.3.41 The baseline assessment has relied on existing data, previous desk study and historical records. The following sources have been reviewed:

- historical mapping and additional environmental information including historical landfill information and contemporary trade directories provided in an Envirocheck report which is appended to the Phase 1 Desk Study Report, provided in **Appendix 11A** of this volume;
- publicly available information from the British Geological Survey (BGS) (Ref. 11.35) online mapping resource;
- Suffolk County Council (SCC) minerals local plan (Ref. 11.36);
- Suffolk Biodiversity Information Service website (Ref. 11.37);
- publicly available information from the Defra Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref. 11.38);

- publicly available information from the Environment Agency (Ref. 11.39);
- the Yell website (Ref. 11.40); and
- Zetica online unexploded ordnance (UXO) risk maps (Ref. 11.41).

11.3.42 It is noted that the Envirocheck report, provided in **Appendix 11A** of this volume, was obtained in 2012. Updated information has therefore been obtained from publicly available sources of information. Information obtained during the site visit undertaken in March 2019 was also used to determine whether there had been any substantial changes between 2012 and present day.

iii. Assessment of effects

11.3.43 An assessment of the potential physical effects of the proposed development on geology, and the effects associated with soils re-use and waste soils has been undertaken using a qualitative approach considering the effects on soil erosion, mineral resources, the potential for soil re-use and waste soil generation in accordance with the methodology outlined previously.

11.3.44 The assessment of the potential effects of the construction, operation, and removal and reinstatement phases of the proposed development on land contamination has been undertaken in accordance with the methodology outlined previously.

i) Assumptions and limitations

11.3.45 The following assumptions have been made in this assessment:

- all assessment considers development within the site parameters as set out in the description of development within **Chapter 2** of this volume**;**
- stockpiling of materials and the landscape bunds would remain within the site boundary;
- landscape bunds would be 3m high (as detailed in **Chapter 2** of this volume), and the vegetation, topsoil and potentially subsoil would be stripped in accordance with the **Outline Soil Management Plan (SMP)** in **Appendix 17C** of **Volume 2** of the **ES**;
- the use of grid connections for electricity rather than generators to reduce the potential for storage of fuels on-site;

- for the operational phase assessment, it has been assumed that all primary, tertiary and secondary mitigation measures proposed for construction have been adopted / implemented; and
- following removal and reinstatement, the site would be restored back to agricultural use, and as such the majority of the underground services, foundations and other below ground structures installed for the operation of the site would be removed and the A12 (Main Road) reinstated back to its original alignment.

11.3.46 The following limitations have been identified:

- ground investigation data is not available for the site and the baseline has been prepared using BGS mapping.

11.4 Baseline environment

11.4.1 This section presents a description of the baseline environmental characteristics within the study area.

11.4.2 Further detail can also be found in **Appendix 11A** of this volume.

a) Current baseline

i. Site visit

11.4.3 A site visit was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk study mapping and aerial photographs. Additionally, it was an opportunity to identify potential visual or olfactory contamination present at the site at the time of the site visit.

11.4.4 The site comprises agricultural fields. The A12 (Main Road) runs along the north-eastern boundary of the site and the existing East Suffolk line along the western boundary of the site. No ground hazards or evidence of contamination were observed during the site visit. A pond was identified adjacent to the boundary with Moate Hall within the site. Further details on observations made during the site visit including photographs can be found in the Phase 1 Desk Study Report, provided in **Appendix 11A** of this volume.

ii. Site history

11.4.5 **Table 11.8** summarises the key historical land use information for the study area. This has been compiled using an Envirocheck report, provided in **Appendix 11A** of this volume.

Table 11.8: Historical development on the site.

Map Date.	Key Contamination Sources On-site.	Key Contamination Sources in Study Area.
1884 (1:2,500).	The majority of the site is shown as enclosed fields bound to the north-west and south-west by the East Suffolk line, and in the south-east and north-east by unnamed roads in the current positions of A12 (Main Road) and Willow Marsh Lane respectively. The north-east of the site is shown as part of an agricultural field bound by the roads identified previously and fields.	The surrounding area comprises predominantly agricultural land and associated farm houses. Darsham railway station is shown immediately south of the site. 'Little Nursery' Wood is shown adjacent to the western site boundary. A small moat is shown adjacent to the eastern site boundary.
1884–1885 (1:10,560).		
1904 (1:2,500).	No substantial changes.	No substantial changes.
1905 (1:10,560).		
1950 - 1951 (1:10,560).		
1957 - 1958 (1:10,000).		
1976 (1:2,500).	No substantial changes.	The area to the immediate south of the site has undergone some development, and two granaries are now labelled. Darsham service station is shown adjacent to the south-east of the site. 'Little Nursery' Wood is now shown to have expanded westwards towards the East Suffolk line.
1982 (1:10,000).	No substantial changes.	Main Road is now labelled as the A12 (T).
1995 (1:2,500).		
2012 (1:10,000).	No substantial changes.	Two granaries are shown; one of the granaries immediately south of the site is now labelled as 'Station Works' whilst the other one is no longer labelled.
Present day.	No substantial changes based on the site visit completed in 2019.	No substantial changes based on the site visit completed in 2019.

iii. Geology

11.4.6 Made Ground is not shown on the BGS online mapping, however the area of the site adjacent to the East Suffolk line, and the areas of the site associated with the existing roads (A12 (Main Road) and Willow Marsh Lane) have the potential to include Made Ground.

11.4.7 Available BGS records indicate that the site is largely underlain by superficial diamicton (boulder clay) deposits of the Lowestoft Formation, which comprise an extensive sheet of poorly-sorted matrix-supported chalky till as well as outwash sands and gravels, silts and clays. A thin strip of land adjacent to the western site boundary is shown to comprise Head (windblown) deposits, comprising clay, silt, sand and gravel deposits.

11.4.8 According to the BGS website, bedrock geology beneath the site comprises sand of the Crag Group, described as 'shallow-water marine and estuarine sands, gravels, silts and clays'. Beneath the Crag Group is the London Clay Formation and the Chalk Group. There are no BGS borehole or trial pit logs available within the study area.

11.4.9 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates that there is either no hazard or very low potential for landslides, ground stability hazards and ground dissolution stability hazards at the site, and a low potential for shrinking or swelling clay. There are also no geological faults located within the study area.

iv. Mineral extraction

11.4.10 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates that the site is in an area unlikely to be affected by mining for coal or other mineral resources.

11.4.11 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates no historical extractive activities on or within the study area. Furthermore, the SCC minerals local plan indicates that the site is not located within a minerals safeguarding area, and there are no planned areas of mineral extraction within the study area.

v. Local geological sites

11.4.12 According to protected sites mapping on the Suffolk Biodiversity Information Service website, the study area is not located within a geological SSSI or local geological site.

vi. Hydrogeology

11.4.13 According to the MAGIC website the Head Deposits and Lowestoft Formation (diamicton) superficial deposits are classified by the Environment Agency as Secondary (Undifferentiated) Aquifers.

11.4.14 According to the MAGIC website and the Envirocheck report, provided in **Appendix 11A** of this volume, the Crag Group bedrock underlying the site is classed as a Principal Aquifer. The site does not lie within or adjacent to a SPZ.

11.4.15 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates there have previously been a number of licensed groundwater abstractions located within the study area in the sand and gravel, chalk and Crag Group for a variety of uses including agricultural (general) purposes and industrial processing. The closest identified abstraction point is a well located adjacent to the south-east of the site. The well was used by Yoxford and Darsham farmers for industrial processes. All of the groundwater abstractions are listed as revoked. There is the potential for unknown Private Water Supplies (PWS) to be in use within the study area. Should any PWS exist, they would likely be associated with the farm buildings and residential properties in the study area.

11.4.16 Further baseline hydrogeology information for the site is provided in **Chapter 12** of this volume.

vii. Hydrology

11.4.17 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates that there is a pond within the eastern section of the site adjacent to Moate Hall, confirmed by the site visit. Several other pond features are shown on available online mapping in the grounds of Moate Hall (approximately 40m from the site), Darsham Cottage (approximately 60m from the site) and a larger pond adjacent to the unnamed road to Darsham Old Hall to the south of the A12 which is approximately 340m from the site.

11.4.18 An unnamed watercourse originates in the east of Martins Farm, approximately 275m to the north-west of the site. The watercourse crosses the East Suffolk line to the south of Willow Marsh Lane crossing and flows southwards along the western boundary of the site. The channel crosses back beneath the East Suffolk line to the south of Little Nursery Wood, and flows to the west of Darsham railway station and joins the Minsmere River approximately 1.2 kilometres (km) south-east of the site.

11.4.19 Further consideration of the hydrology of the site is provided in **Chapter 12** of this volume.

viii. Flood risk

11.4.20 The Environment Agency flood risk map, contained within the Envirocheck report, provided in **Appendix 11A** of this volume, and the Environment Agency website indicate that the site is located in Flood Zone 1, and has a low risk of flooding from rivers or the sea. The Environment Agency's long-term flood risk mapping shows that the majority of the site is also at very low risk of flooding from surface water. However, a potential surface water flow route is indicated along the western site boundary. This flow route runs from north to south and connects to the unnamed watercourse located

immediately west of Darsham railway station, before discharging to the Minsmere River to the south.

11.4.21 An area of high surface water flood risk is located at the northern end of the site. It is suggested that the lower topography adjacent to the A12 to the west leads to pooling of surface water during peak flow events.

11.4.22 Smaller isolated areas of low to high surface water flood risk are also located within the site. Analysis of topographic data shows these are a mixture of topographically low points, ridges and furrows associated with existing agricultural land drainage and management.

11.4.23 Further details on flood risk are provided in the **Northern Park and Ride Flood Risk Assessment** (Doc Ref. 5.3).

ix. Historic and environmentally sensitive sites

11.4.24 A review of the MAGIC website indicates that there are two Grade II listed buildings (Oak Hall and Hill Farmhouse) located approximately 60m and 430m to the north-east of the site.

11.4.25 Sillet's Wood ancient woodland county wildlife site (CWS) is indicated to be present approximately 300m north-west of the site.

11.4.26 Further consideration of designated sites for ecology and historic environment, both statutory and non-statutory, is provided in **Chapter 7** and **Chapter 9** of this volume respectively.

x. Waste management and other permitted sites

11.4.27 The Envirocheck report, provided in **Appendix 11A** of this volume, confirms that there are none of the following facilities within the study area:

- historic landfill sites;
- authorised landfill sites;
- waste transfer sites;
- Control of Major Accident Hazards sites;
- explosive sites;
- Notification of Installations Handling Hazardous Substances;
- Planning Hazardous Substance Consents; and
- Planning Hazardous Substance Enforcements.

xi. Service stations

11.4.28 Darsham service station is located approximately 10m south-east of the site. There are no other service stations within the study area according to the Envirocheck report, provided in **Appendix 11A** of this volume, and the Yell website.

xii. Industrial and other potentially contaminative land uses

11.4.29 The Envirocheck report, provided in **Appendix 11A** of this volume, indicates there is one contemporary trade directory within the study area that has the potential to use contaminants of concern. This is Darsham service station approximately 10m south-east of the site, as listed previously. It is also noted that the site is currently used for agricultural purposes and there are several farms present within the study area which have the potential to use contaminants of concern.

xiii. Potential for unexploded ordnance

11.4.30 A Zetica UXO map was obtained to assess the risk of encountering UXO at the site and is appended to the Phase 1 Desk Study, provided in **Appendix 11A** of this volume. The map indicates that the site is within an area with a low risk of encountering UXO.

xiv. Previous ground investigations

11.4.31 There have been no previous ground investigations undertaken at the site.

b) Future baseline

11.4.32 There is one committed development which has been identified within the study area as summarised in **Table 11.9.**

Table 11.9: Committed developments.

Planning Application Ref.	Site Address.	Description of development.	Date of Approval.	Status	Distance (m).
DC/14/0420/OUT	Land Between Station Garage & Railway Cottage Main Road Darsham Suffolk.	Erection of 82 bedroom hotel, car parking and associated works.	02/05/2014 Reserved matters application approved 23 June 2017 (DC/17/1769/ARM).	Construction not commenced.	29

11.4.33 The construction timeline for this development is unconfirmed. However, planning permissions generally require construction to commence within

three years of the grant of planning permission or reserved matters upon which the planning permission lapses. As such, it has been assumed, given the nature and scale of the applications, that the development will have been constructed prior to 2022. This development has therefore been considered as future receptors, and a potential future source of contamination as part of the baseline for the land contamination risk assessments and within the assessment of physical effects and effects associated with mineral resources, soils re-use and waste soils.

c) Preliminary conceptual site model

11.4.34 A PCSM identifies the potential or known sources of contamination, receptors, and pathways between the two. Where all three are present or are considered likely to be present (source-pathway-receptor linkage), they are called a PCL.

11.4.35 Four PCSMs (baseline, construction, operational and removal and reinstatement) have been produced for the proposed development using the information summarised previously.

11.4.36 A summary of potential contamination sources is provided in **Table 11.10**, and a summary of potential pathways and receptors identified is provided in **Table 11.11**.

Table 11.10: Existing potential sources of contamination for the proposed development.

Potential Source of Contamination.	Potential Contamination.	Approximate Location.
Made Ground associated with the construction of the A12 (Main Road) and Willow Marsh Lane.	A range of inorganic and organic contaminants including polycyclic aromatic hydrocarbons (PAHs), coal tars, asbestos and ground gases. Fuels and oils attributed to spills from vehicles on the roads included within the site boundary, plus exhaust particulates.	On-site
Farmland within site boundary. Potential for unmapped farmers tips.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel/engine oils. Risk of inorganic and organic contamination including metals and hydrocarbons, polychlorinated biphenyls (PCBs), asbestos, etc.	
Darsham service station located adjacent to the south-eastern boundary of the site.	Inorganic and organic contaminants including metals, petroleum, petrol additives, diesel, oils and lubricants.	Off-site
Darsham railway station and station works, adjacent to southern boundary; and the East Suffolk line forming the west boundary.	A range of inorganic and organic contaminants including hydrocarbons, PCBs, PAHs, solvents and creosote; metals; and ash and fill used in the construction of the railway.	

Potential Source of Contamination.	Potential Contamination.	Approximate Location.
Granaries located adjacent to the south-eastern boundary of the site	Risk of inorganic and organic contamination including metals and hydrocarbons, asbestos, etc.	
White House Farm adjacent to the north-east boundary.	Contamination risk from herbicides, pesticides, silage, effluent, and fuel/engine oils. Risk of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	

Table 11.11: Potential receptors and contaminant exposure and migration pathways at baseline and resulting from the proposed development.

Receptor Group.	Receptor	Principal Contaminant Migration Pathways.
Human health (on-site).	Construction and maintenance workers.	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water. Inhalation of soil-derived dust, fibres, gas and vapours.
	Users of the new park and ride site.	
	Users of Willow Marsh Lane.	
	Farmers and workers on agricultural land.	
Human health (off-site).	Residents in adjacent properties and users of adjacent commercial premises/commuters.	Dermal contact with and ingestion of contaminants in soil-derived dusts and water that may have migrated off-site. Inhalation of soil-derived dust, fibres, gas and vapours which may have migrated off-site.
	Pedestrians accessing surrounding roads.	
	Farmers and workers on agricultural land.	
Controlled waters: groundwater (on-site and off-site).	Groundwater in principal bedrock aquifer. Groundwater in secondary undifferentiated superficial aquifer.	Leaching of contaminants in soil to groundwater in underlying aquifers. Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
Controlled waters: surface waters (on-site).	Pond within the east of the site adjacent to Moate Hall and unnamed watercourse along western boundary of the site (retained during construction and operation).	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow. Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Controlled waters: surface waters (off-site).	Drain and ponds within study area.	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow.

Receptor Group.	Receptor	Principal Contaminant Migration Pathways.
		Discharge of contaminants entrained in groundwater and/or surface water run-off followed by overland flow and discharge.
Property (on-site and off-site).	Existing services and structures on-site and off-site including listed buildings. Proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services. Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock (on-site and off-site).	Migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/inhalation/ dermal contact by livestock.
Ecological receptors (off-site).	Sillet's ancient woodland CWS (off-site).	Migration of contaminated waters/dust/fibres and subsequent uptake by woodland or ingestion/inhalation/ dermal contact by fauna.

11.5 Environmental design and mitigation

11.5.1 As detailed in **Volume 1**, **Chapter 6** of the **ES**, a number of primary mitigation measures have been identified through the iterative EIA process, and have been incorporated into the design and construction planning of the proposed development. Tertiary mitigation measures are legal requirements, or are standard practices that would be implemented as part of the proposed development.

11.5.2 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. For geology and land quality, these measures are identified in the following sections, with a summary provided on how the measures contribute to the mitigation, and management of potentially significant environmental effects.

a) Primary mitigation

11.5.3 Primary mitigation is often referred to as 'embedded mitigation' and includes modifications to the location, or design to mitigate impacts; these measures become an inherent part of the proposed development.

11.5.4 Primary mitigation measures for the proposed development would include:

- the design of the access road and car parking areas and the selection of construction materials would be in accordance with the DMRB, British Standards and best practice guidance at the time of the design. The design would be required to take into account the ground conditions

including the potential for ground movement, compaction, ground gas and ground aggressivity;

- gas mitigation measures would be provided in the buildings on-site (such as the amenity and welfare building, security building, security booth), and other relevant structures where required; the design of which would be dependent on the risk profile and the nature/usage of the building/structure;
- hardstanding would be used on the access road and internal roads to reduce spills and leaks infiltrating into the ground where required; and
- the use of appropriate drainage systems in accordance with the **Drainage Strategy** in **Appendix 2B** of **Volume 2** of the **ES**, to reduce the potential for contamination to migrate and impact on the ground, groundwaters and surface waters. This would include the use of lined drainage and bypass separators where necessary to protect the ground and underlying groundwater and separate out oils/hydrocarbons for suitable off-site disposal.

b) Tertiary mitigation

11.5.5 Tertiary mitigation will be required regardless of any EIA assessment as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

11.5.6 Tertiary mitigation measures to be incorporated into the proposed development during construction and the removal and reinstatement phases, as set out in the **CoCP** (Doc Ref. 8.11), include:

- prior to stockpiling or other groundworks, topsoil present would be removed and appropriately stored for potential re-use in landscaping areas, subject to demonstrating suitability for reuse criteria. This process would reduce the potential for buried topsoil to generate ground gas beneath the proposed development which may pose a risk to human health;
- development of health and safety risk assessments and method statements by the contractor (including emergency response procedures), and provision of appropriate personal protective equipment (PPE) for the protection of construction workers;
- implementation of a contamination watching brief by suitably qualified and experienced personnel would be completed for the proposed development when excavating areas of potential contamination risk. If unidentified contamination is encountered, works will be temporarily suspended in the area and appropriate investigations and remediation

will be discussed and agreed with stakeholders and completed in accordance with current best practice;

- implementation of appropriate dust suppression measures to reduce migration of contaminated dust, further details are provided in **Chapter 5** of this volume;
- minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to reduce soil erosion and reduce temporary effects on soil compaction;
- stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) to reduce windblown dust and surface water run-off;
- clear segregation between stockpiled material including imported material, excavated material stockpiled for re-use and excavated waste material stockpiled for treatment and / or off-site disposal;
- covering/hydroseeding of the landscape bunds and temporary stockpiles may be completed to reduce soil erosion and dust generation;
- stockpiles would be located a minimum of 10m from the nearest watercourse;
- implementation of working methods during construction to ensure that surface water run-off from the works, landscape bunds, stockpiles or working area is minimised and captured prior to entry into adjacent surface watercourses, or leaching into underlying groundwater in accordance with best practice;
- implementation of appropriate pollution incident control e.g. plant drip trays and spill kits and suitable training and toolbox talks completed; and
- implementation of appropriate and safe storage of fuel, oils, chemicals and equipment during construction in accordance with Control of Substances Hazardous to Human Health Regulations 2002 and oil storage regulations.

11.5.7 Additional tertiary mitigation that would be anticipated and referenced in the **CoCP** (Doc Ref. 8.11) includes:

- implementation of an appropriate **Materials Management Strategy** to document how the excavated materials would be dealt with via **Materials Management Plan(s**) (MMP) and verification report(s) to record the excavation and placement of materials at the site. Further

details are provided in the **Materials Management Strategy** in **Appendix 3A** of **Volume 2** of the **ES**.

- implementation of a site waste management plan in accordance with the **Waste Management Strategy** in **Appendix 8A** of **Volume 2** of the **ES**; and
- implementation of an **Outline SMP** in **Appendix 17C** of **Volume 2** of the **ES**.

11.5.8 For the operational phase, storage and disposal of wastes and hazardous substances, where required, would be managed in accordance with current guidance and legislative requirements.

11.6 Assessment

a) Introduction

11.6.1 This section presents the findings of the geology and land quality assessment for the construction, operation, and removal and reinstatement phases of the proposed development.

11.6.2 This section identifies any likely significant effects that are predicted to occur and **section 11.7** of this chapter highlights the secondary mitigation and monitoring measures that are proposed to minimise any adverse significant effects (if required).

b) Construction

i. Physical effects

11.6.3 A qualitative approach has been undertaken to assess the likely physical effects of the proposed development. The effects have then been categorised in accordance with the methodology outlined in **Volume 1, Appendix 6N** of the **ES**, and summarised in **section 11.3** of this chapter**,** and confirmed as either temporary or permanent, adverse or beneficial and significant (moderate or major effects), or not significant (minor or negligible).

11.6.4 The Phase 1 Desk Study Report, provided in **Appendix 11A** of this volume, indicates that there is either no hazard, or a very low or low potential for landslides, ground stability hazards, ground dissolution stability hazards and shrinking or swelling clay to occur at the site. Given this and the nature of the works, ground instability and soil compaction have been scoped out of further assessment.

Soil erosion

11.6.5 The construction phase of the proposed development may result in effects on soils erosion associated with stripping of topsoil, vegetation clearance, stockpiling, earthworks and construction of new buildings, infrastructure and landscaping.

11.6.6 Earthworks, including areas for temporary works, are anticipated for the construction of the proposed development with topsoil, and potentially sub soil, being stockpiled in up to 3m high landscape bunds around the site. There is therefore the potential for increased soil erosion and surface water run-off with a high sediment load which may impact local surface waters. Earthworks would be managed in accordance with the **CoCP** to minimise soil exposure as far as practicable. Stockpiles would be managed in accordance within primary and tertiary measures set out in **section 11.5** of this chapter and the **CoCP** to reduce soil erosion and dust generation by management practices which may include water spraying and hydroseeding. The impacts on soil erosion during the construction phase are therefore considered to be temporary, short-term, and direct.

11.6.7 Given that there are limited soil erosion hazards at the site, the value/sensitivity of the receptor is classed as low. With the primary and tertiary mitigation measures set out in **section 11.5** of this chapter the magnitude of the impact is considered to be very low. The overall effect is therefore considered to be negligible, and classed as **not significant**.

ii. Mineral resources

11.6.8 A qualitative approach has been undertaken to assess the likely effects of the proposed development on mineral resources in accordance with the methodology outlined in **Volume 1, Appendix 6N** of the **ES** and summarised in **section 11.3** of this chapter.

11.6.9 The proposed development has the potential to impact mineral resources and associated mineral safeguarding areas through the loss, damage or sterilisation of an important mineral resource.

11.6.10 The baseline assessment indicates that the site and study area are not located within a coal mining area, an area of historical or planned mineral extraction or a minerals safeguarding area. Therefore, there would be limited impact on the regional mineral resources from the proposed development. The impacts on mineral resources during the construction phase are therefore considered to be temporary, short-term and direct.

11.6.11 Given that there are no protected mineral resources and no previous extraction located within the study area, the value/sensitivity of the receptor

is classed as very low. The magnitude of the impact is considered to be very low as there would be limited loss of regional mineral resources.

11.6.12 The overall effect is therefore considered to be negligible and classed as **not significant**.

iii. Effects associated with ground contamination

11.6.13 The construction PCSM and risk assessment are presented in **Appendix 11B** and the impact assessment in **Appendix 11C** of this volume. The construction impact assessment is undertaken by comparing the baseline land contamination risks to those predicted during construction, while considering any new sources and pollution pathways introduced by construction activities.

11.6.14 The construction phase would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination. Construction activities such as excavation may introduce new pathways for migration of existing contamination and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration. Potential changes to the baseline situation creating PCLs, which have been assessed within this chapter are:

- the potential for mobilising contaminants by excavation and stockpiling of material, increasing the risk to controlled water receptors through leaching and run-off. Earthworks could provide opportunities for run-off to contain suspended solids if not carried out in line with required management procedure;
- the potential for introducing new sources of contamination i.e. from spillages and leaks;
- the potential for exposure of human receptors by generation of potentially contaminated dust and vapours released by the construction works; and
- the potential for creation of new pathways to groundwater during groundworks, through opening up ground temporarily and construction activities, such as earthworks, installation of drainage and other below-ground services and foundations.

11.6.15 The impacts on land contamination during the construction phase are considered to be permanent and direct. Primary and tertiary mitigation measures would be incorporated into the construction process as outlined in **section 11.5** of this chapter. These would include the adoption of working methods during construction to manage groundwater appropriately,

implementation of appropriate pollution incident control and implementation of appropriate and safe storage of fuel, oils and equipment.

11.6.16 A summary of the construction phase PCSM and impact assessment is provided in **Table 11.12**, and includes the risks identified to the receptors. A more detailed assessment of construction risk and impact assessment is provided in **Appendices 11B** and **11C** of this volume.

11.6.17 It is considered that with the primary and tertiary mitigation measures adopted, the risks identified to human health, controlled waters, property and ecological receptors during construction would range between very low to moderate/low. Compared to the existing baseline, the level of risk to receptors has generally remained the same or increased during the construction phase. An overall negligible to minor adverse effect has therefore been predicted, which is classed as **not significant**.

Table 11.12: Construction phase effects for the proposed development.

Receptor	Value/ Sensitivity.	Baseline Risk.	Construction Risk.	Classification of Effect.
Human (on-site).	High	Very low.	Low	Minor adverse (**not significant**).
Human (off-site).	High	Very low.	Low	Minor adverse (**not significant**).
Controlled waters: groundwater (on-site and off-site).	Medium	Low	Moderate/low.	Minor adverse (**not significant**).
Controlled waters: surface water (on-site pond and unnamed watercourse).	Low	Very low.	Low	Minor adverse (**not significant**).
Controlled waters: surface water (off-site drain and ponds).	Low	Very low.	Very low.	Negligible (**not significant**).
Property: existing and future structures and services (on-site and off-site).	Medium	Very low.	Very low to Low.	Negligible to Minor adverse (**not significant**).
Property: crops and livestock (on-site and off-site).	Medium	Very low.	Low	Minor adverse (**not significant**).
Ecological receptors (off-site).	High	Very low.	Low	Minor adverse (**not significant**).

iv. Effects associated with waste soils and soil re-use

11.6.18 Waste soils would be generated during construction through excavations and the installation of drainage/services. There is the potential that waste soil generated from the earthworks would be classified as geotechnically and/or chemically unsuitable for reuse on-site or hazardous, therefore requiring removal from site. Waste soils would be dealt with in accordance with the **Waste Management Strategy** presented in **Volume 2**, **Appendix 8A** of the **ES**.

11.6.19 A MMP in accordance with the **Materials Management Strategy** in **Appendix 3A** of **Volume 2** of the **ES** would set out how material is managed on-site during construction and removal and reinstatement in accordance with appropriate guidance such as the Contaminated Land: Applications in Real Environments Development Industry Code of Practice, to allow the sustainable re-use of suitable soils during the construction and removal and reinstatement of the proposed development. An **Outline SMP** set out in **Appendix 17C** of **Volume 2** of the **ES** would also be implemented to manage the reinstatement of agricultural land.

11.6.20 In line with the waste hierarchy, the design would seek, as far as reasonably practicable, to reduce the amount of soil/materials excavated and/or of a hazardous nature, to reuse and recycle waste soils/materials on-site where possible and to manage soils/materials suitably including off-site disposal of waste, if required, in accordance with relevant legislation. Therefore, the impacts associated with waste soils and soil re-use during the construction phase are considered to be temporary, short-term and direct.

11.6.21 Given that Made Ground is likely to be very limited or absent at the site and there is a moderate potential for soils reuse, the value/sensitivity of the receptor is classed as medium. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be low. The overall effect is therefore considered to be minor adverse and therefore **not significant**.

v. Inter-relationship effects

11.6.22 This section provides a description of the identified inter-relationship effects that are anticipated to occur on geology and land quality receptors between the individual environmental effects arising from construction of the proposed development.

11.6.23 There are anticipated to be inter-relationship effects between geology and land quality, soils and agriculture, ecology, heritage and groundwater and surface water in relation to potential receptors which could be impacted by ground contamination during the construction of the proposed development.

11.6.24 Potential impacts would include the contamination of sensitive/high value receptors such as good quality or best and most versatile (BMV) agricultural land, SSSIs, listed buildings, principal aquifers, WFD rivers and groundwater SPZs during construction works. Construction activities may introduce new sources of contamination, new pathways for migration of contamination and disturb and mobilise existing sources of contamination.

11.6.25 However, given the primary and tertiary mitigation measures proposed in relation to these disciplines as outlined in **section 11.5** of this chapter, it is not expected that the combined impact of these inter-relationship effects would be greater than those effects predicted for the geology and land quality assessment as presented in this chapter. Only minor adverse inter-relationship effects are anticipated, which are classified as **not significant**. Further details are provided in **Chapter 10** and **Chapter 12** of this volume.

c) Operation

i. Physical effects: soil erosion

11.6.26 Physical effects are considered to be mainly related to the construction phase. During operation, there would be limited effects on soil erosion through maintenance operations. Suitable design and subsequent maintenance works would also minimise physical effects, and the proposed development would be operated in accordance with the relevant regulations and best practicable measures. The impacts on soil erosion during the operational phase are therefore considered to be temporary, short-term, and direct.

11.6.27 Given that there are limited soil erosion hazards at the site and hazards would be mitigated during the construction phase, the value/sensitivity of the receptor is classed as low. With the primary and tertiary mitigation measures the magnitude of the impact is considered to be very low. Therefore, it is considered that physical effects would remain as negligible and are classed as **not significant**.

ii. Mineral resources

11.6.28 Effects in relation to mineral resources during the operation phase relate to the permanent sterilisation/loss of minerals, preventing future extraction. The impacts on mineral resources during the operational phase are therefore considered to be temporary, medium term, and direct.

11.6.29 Given that there are no protected mineral resources and no previous mineral extraction located within the study area, the value/sensitivity of the receptor is classed as very low. The magnitude of the impact is considered to be very low as there would be limited loss of regional mineral resources. Effects in

relation to loss, damage or sterilisation of mineral resources would remain as negligible and are classed as **not significant**.

iii. Effects associated with ground contamination

11.6.30 The operational PCSM and risk assessment are presented in **Appendix 11B** and the impact assessment in **Appendix 11C** of this volume. The operational impact assessment has been undertaken by comparing the baseline land contamination risks to those predicted during operation, while considering any new sources and pollution pathways introduced by operational activities.

11.6.31 The operation of the proposed development would potentially introduce new sources of contamination. Spillages and leaks may occur, and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. The impacts on land contamination during the operational phase are considered to be permanent and direct.

11.6.32 A summary of the operational phase contamination effects is provided in **Table 11.13**. A more detailed assessment of operation risk and impact assessment is provided in **Appendices 11B** and **11C** of this volume. It is considered that with proposed mitigation, risks identified to human health, controlled waters, property and ecological receptors during operation are assessed as very low to low. Compared to the existing baseline, the level of risk to receptors has generally remained the same or slightly reduced. An overall negligible to minor beneficial effect is therefore anticipated which is classed as **not significant**.

Table 11.13: Operational phase effects for the proposed development.

Receptor	Sensitivity/ Value.	Baseline Risk.	Operation Risk.	Classification of Effect.
Human (on-site).	High	Very low.	Very low.	Negligible (**not significant**).
Human (off-site).	High	Very low.	Very low.	Negligible (**not significant**).
Controlled waters: surface water (on-site pond and unnamed watercourse).	Medium	Low	Very low.	Minor beneficial (**not significant**).
Controlled waters: surface water (off-site drain and ponds).	Low	Very low.	Very low.	Negligible (**not significant**).
Controlled waters: surface water (off-site drain, unnamed watercourse and ponds).	Low	Very low.	Very low.	Negligible (**not significant**).

Receptor	Sensitivity/ Value.	Baseline Risk.	Operation Risk.	Classification of Effect.
Property: existing and future structures and services (on-site and off-site).	Medium	Very low.	Very low.	Negligible (**not significant**).
Property: crops and livestock (on-site and off-site).	Medium	Very low.	Very low.	Negligible (**not significant**).
Ecological receptors (off-site).	High	Very low.	Very low.	Negligible (**not significant**).

iv. Effects associated with waste soils and soil re-use

11.6.33 The proposed development may also generate limited waste soils during operation due to maintenance requirements which may include excavations for landscaping and for repairs or maintenance of services. The proposed development would also be operated in accordance with the relevant regulations and best practice pollution prevention guidance. The impacts associated with waste soils and soils re-use during the operational phase are assessed to be temporary, short-term and indirect.

11.6.34 Given that there is less potential for soil re-use during the operational phase, the value/sensitivity of the receptor is classed as low. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be very low. The overall effect is therefore assessed to be negligible and classed as **not significant**.

v. Inter-relationship effects

11.6.35 This section provides a description of the identified inter-relationship effects that are anticipated to occur on geology and land quality receptors between the individual environmental effects arising from operation of the proposed development.

11.6.36 There are anticipated to be inter-relationship effects between geology and land quality, soils and agriculture, ecology, heritage and groundwater and surface water in relation to potential receptors which could be impacted by ground contamination during the operation of the proposed development.

11.6.37 Potential impacts would include the contamination of sensitive/high value receptors such as good quality or BMV agricultural land, SSSIs, listed buildings, principal aquifers, WFD rivers and groundwater SPZs during operation. Operation of the proposed development may introduce new sources of contamination and new pathways for migration of contamination.

11.6.38 However, given the primary and tertiary mitigation measures proposed in relation to these disciplines as outlined in **section 11.5** of this chapter, it is not expected that the combined impact of these inter-relationship effects

would be greater than those effects predicted for the geology and land quality assessment as presented within this chapter. Only minor adverse inter-relationship effects are anticipated, which are classified as **not significant**. Further details are provided in **Chapter 10** and **Chapter 12** of this volume.

d) Removal and Reinstatement

i. Physical effects: soil erosion

11.6.39 The removal and reinstatement phase may result in effects on soil erosion associated with the removal and reinstatement of structures, pad foundations, pavements, drainage and earthworks including the reinstatement of subsoil/topsoil.

11.6.40 Earthworks are anticipated for the removal of the landscape bunds and reinstatement of the topsoil/subsoil across the site. There is the potential for increased surface water run-off with a high sediment load that is likely to impact local surface waters (further details of impacts on surface waters provided in **Chapter 12** of this volume). In accordance with the **CoCP** (Doc Ref. 8.11), and defined tertiary mitigation, earthworks would be planned to minimise soil exposure as far as practicable and would be managed to reduce soil erosion and dust production. The impacts on soil erosion during the removal and reinstatement phase are therefore considered to be temporary, short-term and direct.

11.6.41 Given that there are limited soil erosion hazards at the site, the value/sensitivity of the receptor is classed as low. With proposed mitigation, the magnitude of the impact is considered to be very low. Therefore, the overall effect on soil erosion is considered to be negligible and classed as **not significant**.

ii. Mineral resources

11.6.42 Given that there are no valuable mineral resources located within the study area, the value/sensitivity of the receptor is classed as very low. The impacts on mineral resources during the removal and reinstatement phase are considered to be temporary, short-term and direct. The magnitude of the impact is considered to be very low as there would be limited loss of regional mineral resources. Effects in relation to loss, damage, or sterilisation of mineral resources would therefore be negligible, and are classed as **not significant**.

iii. Effects associated with ground contamination

11.6.43 The proposed development would be removed and reinstated to agricultural use. The removal and reinstatement impact assessment is undertaken by comparing the baseline land contamination risks to those predicted during

removal and reinstatement, while considering any new sources and pollution pathways which may be introduced by removal and reinstatement activities.

11.6.44 A summary of the risks identified during the removal and reinstatement phase to receptors and impact assessment is presented in **Table 11.14**. Further detail is provided in **Volume 3, Appendices 11B** and **11C** of the **ES**. The impacts on land contamination during the removal and reinstatement phase are considered to be permanent and direct.

11.6.45 With proposed mitigation incorporated into the design and effectively implemented during the removal and reinstatement phase, risks identified to human health, controlled waters, property and ecological receptors are assessed as very low to moderate/low. Compared to the existing baseline, the level of risk to receptors during the removal and reinstatement phase has generally remained the same or increased. An overall negligible to minor adverse effect is therefore anticipated which is classed as **not significant**.

Table 11.14: Removal and reinstatement phase effects for the proposed development.

Receptor	Sensitivity/Value	Baseline Risk	Removal and Reinstatement Risk	Classification of Effect
Human (on-site).	High	Very low.	Low	Minor adverse (**not significant**).
Human (off-site).	High	Very low.	Very low.	Negligible (**not significant**).
Controlled waters: groundwater (on-site and off-site).	Medium	Low	Moderate/low.	Minor adverse (**not significant**).
Controlled waters: surface water (on-site pond and unnamed watercourse).	Low	Very low.	Low	Minor adverse (**not significant**).
Controlled waters: surface water (off-site drain and ponds).	Low	Very low.	Very low.	Negligible (**not significant**).
Property: existing and future structures and services (on-site and off-site).	Medium	Very low.	Very low to low.	Negligible to minor adverse (**not significant**).
Property: crops and livestock (on-site and off-site).	Medium	Very low.	Low	Minor adverse (**not significant**).

Receptor	Sensitivity/Value	Baseline Risk	Removal and Reinstatement Risk	Classification of Effect
Ecological receptors (off-site).	High	Very low.	Low	Minor adverse (**not significant**).

iv. Effects associated with waste soils and soil re-use

11.6.46 Waste soils would be generated during removal and reinstatement through excavation and the removal of foundations, drainage, utilities/services. There is the potential that waste soil generated from the earthworks is classified as unsuitable for re-use on-site or as hazardous, requiring removal from the site. Waste soils would be dealt with in accordance with the **Waste Management Strategy** presented in **Volume 2**, **Appendix 8A** of the **ES**.

11.6.47 Soils would be managed as part of the proposed tertiary mitigation for the removal and reinstatement works through an MMP to allow the re-use of suitable soils during the removal and reinstatement phase of the proposed development. Therefore, the impacts on waste soils and soil re-use during the removal and reinstatement phase are considered to be temporary, short-term and direct.

11.6.48 The value/sensitivity is classed as medium. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be low. The overall effect is therefore considered to be minor adverse and would be **not significant**.

v. Inter-relationship effects

11.6.49 This section provides a description of the identified inter-relationship effects that are anticipated to occur on geology and land quality receptors between the individual environmental effects arising from operation of the proposed development.

11.6.50 There are anticipated to be inter-relationship effects between geology and land quality, soils and agriculture, ecology, heritage and groundwater and surface water in relation to potential receptors which could be impacted by ground contamination during the removal and reinstatement of the proposed development.

11.6.51 Potential impacts would include the contamination of sensitive/high value receptors such as good quality or BMV agricultural land, SSSIs, listed buildings, principal aquifers, WFD rivers and groundwater SPZs during construction works. Removal and reinstatement activities may introduce new sources of contamination, new pathways for migration of contamination and disturb and mobilise existing sources of contamination.

11.6.52 However, given the primary and tertiary mitigation measures proposed in relation to these disciplines as outlined in **section 11.5** of this chapter, it is not expected that the combined impact of these inter-relationship effects would be greater than those effects predicted for the geology and land quality assessment as presented within this chapter. Only minor adverse inter-relationship effects are anticipated, which are classified as **not significant**. Further details are provided in **Chapter 10** and **12** of this volume.

11.7 Mitigation and monitoring

a) Introduction

11.7.1 Primary and tertiary mitigation measures which have been accounted for as part of the assessment are summarised in **section 11.5** of this chapter. Where further mitigation is required this is referred to as secondary mitigation, and where reasonably practicable, secondary mitigation measures have been proposed.

11.7.2 This section describes the proposed secondary mitigation measures for geology and land quality, as well as describing any monitoring required of specific receptors/resources or for the effectiveness of a mitigation measure.

b) Mitigation

11.7.3 A ground investigation would be undertaken to inform the detailed design of the proposed development, and confirm ground conditions, contamination status and other ground related risks. This would be completed prior to the commencement of construction works. Where the ground investigation and subsequent generic risk assessments identify unacceptable levels of contamination and ground related risks, further detailed quantitative risk assessment followed by, where necessary, the remediation of soil and groundwater contamination prior to construction may be required.

11.7.4 Intrusive ground investigation would also be undertaken post operation of the development as part of the removal and reinstatement phase. This ground investigation would confirm the ground conditions, contamination status and other ground related risks at the site following the operational phase. Remediation of soil or ground contamination would be undertaken if deemed necessary to ensure the site was suitable for use as agricultural land.

c) Monitoring

11.7.5 A programme of short-term gas and groundwater monitoring would be designed as part of the ground investigation, and would be required prior to construction works commencing. The results of this short-term monitoring would determine whether further long-term gas and groundwater monitoring is required during the construction and operational phases.

11.7.6 A contamination watching brief by suitably qualified and experienced personnel would be implemented when excavating areas of potential contamination risk.

11.8 Residual effects

11.8.1 **Tables 11.15, 11.16** and **11.17** present a summary of the geology and land quality assessment. They identify the receptor(s) likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

Table 11.15: Summary of effects for the construction phase.

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Secondary Mitigation	Residual Effects
Geology	Soil erosion.	Health and safety risk assessments, method statements, and appropriate PPE for the protection of construction workers. Implementation of measures in the CoCP during construction works. Design and selection of construction materials in accordance with best practice.	Minor adverse.	Ground investigation and relevant risk assessments completed prior to detailed design and construction works. Remediation of soil and groundwater, if necessary. Longer term gas and groundwater monitoring, if necessary.	Minor adverse (**not significant**).
Mineral resources.	Loss, damage or sterilisation.		Negligible		Negligible (**not significant**).
Human health.	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant**).
Controlled waters (groundwater).	Contamination from on-site and off-site sources.		Minor adverse.		Minor beneficial (**not significant**).
Controlled waters (surface water on and off-site).	Contamination from on-site and off-site sources.		Negligible to minor adverse.		Negligible (**not significant**).
Property (existing and future structures and services).	Contamination from on-site and off-site sources.		Negligible to Minor adverse.		Negligible (**not significant**).
Property (crops and livestock).	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant**).
Ecological	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant**).

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Secondary Mitigation	Residual Effects
Soils	Impacts from waste soils generated during construction works.		Minor adverse.		Minor adverse (**not significant**).

Table 11.16: Summary of effects for the operational phase.

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Secondary Mitigation	Residual Effects
Geology	Soil erosion.	Use spill response kits and adequate staff training. Use of hardstanding to reduce impact from spills and leaks. Incorporation of bypass separators within the drainage design where considered necessary. The use of appropriate sustainable drainage system schemes. The use of grid connections for electricity rather than generators. Appropriate storage and disposal of chemicals, oils, fuels, materials and wastes in accordance	Negligible	Longer term gas and groundwater monitoring if necessary.	Negligible **(not significant**).
Mineral resources.	Loss, damage or sterilisation.		Negligible		Negligible (**not significant**).
Human health.	Contamination from on-site and off-site sources.		Negligible		Negligible (**not significant**).
Controlled waters (groundwater).	Contamination from on-site and off-site sources.		Minor beneficial.		Minor beneficial (**not significant**).
Controlled waters (surface water on and off-site).	Contamination from on-site and off-site sources.		Negligible		Negligible (**not significant**).
Property (existing and future structures and services).	Contamination from on-site and off-site sources.		Negligible		Negligible (**not significant**).
Property (crops and livestock).	Contamination from on-site and off-site sources.		Negligible		Negligible (**not significant**).
Ecological	Contamination from on-site and off-site sources.		Negligible		Negligible (**not significant**).
Soils	Impacts from waste soils generated		Negligible		Negligible (**not significant**).

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Secondary Mitigation	Residual Effects
	during operation.	with current guidance.			

Table 11.17: Summary of effects for the removal and reinstatement phase.

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Geology	Soil erosion.	Implementation of measures in the **CoCP** (Doc Ref. 8.11). Health and safety risk assessments, method statements and appropriate PPE for the protection of construction workers.	Negligible	Further ground investigation and risk assessment post operation to confirm the risks at the time of removal and reinstatement, and identify areas requiring further remediation. Remediation of soil and groundwater due to incident occurring during the operational phase if necessary.	Negligible (**not significant**).
Mineral resources.	Loss, damage or sterilisation.		Negligible		Negligible (**not significant**).
Human health.	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant**).
Controlled waters (groundwater).	Contamination from on-site and off-site sources.		Minor adverse.		Minor beneficial (**not significant**).
Controlled waters (surface water on and off-site).	Contamination from on-site and off-site sources.		Negligible to minor adverse.		Negligible (**not significant**).
Property (existing and future structures and services).	Contamination from on-site and off-site sources.		Negligible to Minor adverse.		Negligible (**not significant**).
Property (crops and livestock).	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant).**
Ecological	Contamination from on-site and off-site sources.		Minor adverse.		Negligible (**not significant**).
Soils	Impacts from waste soils generated during operation.		Minor adverse.		Minor adverse (**not significant**).

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