

Riverside Energy Park

Preliminary Environmental Information Report

CHAPTER:

13

PLANNING INSPECTORATE REFERENCE NUMBER:
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GROUND CONDITIONS

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Planning Act 2008 | Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Appendix I

I.1 – Riverside Energy Park – Phase 1 Ground Condition Assessment

13 Ground Conditions

13.1 Introduction

- 13.1.1 This chapter presents the preliminary findings of the assessment of likely significant effects on ground conditions arising from the construction, operation, and decommissioning of the Proposed Development.
- 13.1.2 Peter Brett Associates LLP (PBA) has prepared this chapter relating to ground conditions. In accordance with the Infrastructure EIA Regulations 2017, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare the Environmental Statement (ES) is provided in **Appendix A.3**.
- 13.1.3 Baseline conditions for the Riverside Energy Park (REP) site have been identified using a Phase 1 Ground Condition Assessment (GCA), undertaken by PBA in 2018, which presents information on the geotechnical and geoenvironmental setting of the REP site, included as **Appendix I.1**.

13.2 Policy Context, Legislation, Guidance and Standards

Legislation and Policy

- 13.2.1 The role of the planning system is to control future development and land use. UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act 1990. This introduced a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. The broad approach, concepts and principles with respect to land contamination management in Part 2A should be applied in the determination of planning applications. Part 2A focuses on the identification and remediation of land which in its current use poses an unacceptable risk to people or the environment.
- 13.2.2 The assessment of risk arising from contamination and remediation requirements should be considered on the basis of both the current and proposed use. The underlying approach to identifying and dealing with risk and the broad policy objective of safeguarding human health and the environment are similar for both the planning system and Part 2A.
- 13.2.3 The Regulations and Statutory Guidance that accompany the Environmental Protection Act, include the Contaminated Land Statutory Guidance for England 2012 and the Contaminated Land (England) Regulations 2006, which have been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263). The guidance includes a definition of 'risk', where a risk is said to be a combination of "*(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and (b) the scale and seriousness of such harm or pollution if it did occur*".
- 13.2.4 The Environmental Damage (Prevention and Remediation) Regulations came into force on 19th July 2015 and implement the European Environmental Liability Directive. The Regulations provide that, for certain activities, where there is an imminent risk of environmental damage, steps must be taken to prevent such damage. If environmental damage has already occurred; the regulations stipulate that the operator of the activity must prevent further damage. The provisions include enforcement procedures including criminal sanctions for breaches of the Regulations.

- 13.2.5 Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters. The Environmental Permitting (England and Wales) Regulations 2016 have replaced those parts of the Water Resources Act 1991 that relate to the regulation of discharges to controlled waters (including groundwater). Under the Environmental Permitting Regulations, groundwater activities relate to inputs of pollutants to groundwater. The Environmental Permitting Regulations also replace the Groundwater Regulations 2009.
- 13.2.6 The Environmental Permitting Regulations clarify four objectives that specifically relate to groundwater quality in the Water Framework Directive (2000):
- Achieve ‘Good’ groundwater chemical status by 2015, commonly referred to as ‘status objective’;
 - Achieve Drinking Water Protected Area Objectives;
 - Implement measures to reverse any significant and sustained upward trend in the concentration of any pollutant, referred to as ‘trend objective’; and
 - Prevent or limit the inputs of pollutants into groundwater, commonly referred to as ‘prevent or limit’ objectives.
- 13.2.7 The Water Act 2003 (Commencement No.11) Order 2012 brought into full force the amendments in Section 86 of the Water Act 2003 for the test for ‘contaminated land’ which relates to water pollution, so that pollution of controlled waters must now be ‘significant’ to meet the definition of contaminated land.

National Planning Policy

- 13.2.8 As outlined in **Chapter 2**, the relevant National Policy Statements provide the primary basis for decisions by the Secretary of State on nationally significant infrastructure projects.
- 13.2.9 Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk based approach to addressing historical contamination. With regard to historical contamination, regulatory intervention is held in reserve for land that meets the legal definition of “contaminated land” and poses an unacceptable risk that cannot be dealt with through any other means, including through planning.
- 13.2.10 The National Policy Statements (NPSs) set out national policy on applications for energy infrastructure (EN-1), renewable energy infrastructure (EN-3); and, the electricity transmission and distribution network (EN-5). These policy statements require that developments should be subject to project level assessments, including a requirement for Environmental Impact Assessment (EIA), to address location specific effects. The NPSs set out assessment principles associated with pollution control and geological conservation.
- 13.2.11 At paragraph 4.10.3, NPS EN-1 states:

“In considering an application for development consent, the IPC should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. It should act to compliment but seek to duplicate them.”

National Planning Policy Framework

13.2.12 Section 11, paragraphs 120 and 121 of the National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) (DCLG) describe the policy considerations that local planning authorities should have regard to when preparing policies for development plans and in making decisions on applications in respect of land affected by contamination. After remediation required through the planning process, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990 as highlighted below (Para 121).

13.2.13 For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use. The NPPF stipulates that planning policies and decisions on planning applications should ensure that:

“the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation”; and that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is presented.” (Para 121).

13.2.14 The NPPF (paragraph 121) and the definition of ‘Site Investigation Information’ given within NPPF Annex 2: Glossary, states that desk study and site reconnaissance is the minimum requirement to support any planning application for a site that might be affected by land instability.

Planning Policy Guidance

13.2.15 Further information is given in a Planning Practice Guidance Note on “Land stability” published by DCLG in March 2014. Paragraph:

006 (Reference ID: 45-006-20140306) states “A preliminary assessment of ground instability should be carried out at the earliest possible stage before a detailed planning application is prepared. Developers should ensure that any necessary investigations are undertaken to ascertain that their sites are and will remain stable or can be made so as part of the development of the site. A site needs to be assessed in the context of surrounding areas where subsidence, landslides and land compression could threaten the development within its anticipated life or damage neighbouring land or property. Such information could be provided to the planning authority in the form of a land stability or slope stability risk assessment report. Developers may choose to adopt phased reporting, e.g. desk study results followed by ground investigation results”.

National Planning Policy for Waste 2014

13.2.16 Section 4 of the National Planning Policy for Waste (NPPW) indicates that in identifying suitable sites and areas for waste management, Waste Planning Authorities should consider the likely impact on the local environment against locational criteria. Appendix B to the NPPW describes the locational criteria and these include ‘protection of water quality’ and ‘land instability’.

Emerging National Planning Policy

Draft National Planning Policy Framework

13.2.17 The draft National Planning Policy Framework (NPPF) generally restructures the existing policies in relation to ground conditions and pollution, to provide greater clarity. The principal policies as stated above remain unchanged.

13.2.18 Under paragraph 168, the draft document does however amend the previous paragraph 109 relating to ‘Conserving and enhancing the natural environment’ in that the Planning Policies and decisions should contribute to and enhance the natural and local environment and now specifically under subclause e) that “*Development should wherever possible, help to improve local environmental conditions*”.

Regional Planning Policy

The London Plan – March 2016

13.2.19 The 2016 London Plan sets out “*an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years*”.

13.2.20 Policy 5.21 (Contaminated Land) states “*The Mayor supports the remediation of contaminated sites and will work with strategic partners to ensure that the development of brownfield land does not result in significant harm to human health or the environment, and to bring contaminated land to beneficial use*” and “*Appropriate measures should be taken to ensure that development on previously contaminated land does not activate or spread contamination*”.

13.2.21 Paragraphs 5.95 and 5.95A respectively state that “*Any land that is affected by contamination, whether or not identified under the regulations, may require measures to prevent contamination being activated or spread when building takes place*” and “*Where potentially contaminating activities are proposed, development should include appropriate measures to mitigate any potential harmful effects*”.

Relevant Mayoral strategy and planning guidance documents

13.2.22 Chapter 4 of Supplementary Planning Guidance (SPG) ‘Sustainable Design and Construction’ is titled ‘Pollution Management – Land, Air, Noise, Light and Water’ and Section 4.2 refers specifically to ‘Land Contamination’. This chapter describes the following Mayor’s priorities; “*Developers should set out how existing land contamination will be addressed prior to the commencement of their development*” and ‘Potentially polluting uses are to incorporate suitable mitigation measures’. Within the text it is stated that “*Early identification of land contamination issues enable the consideration of mitigation measures, phasing and the potential to implement less expensive, and more sustainable, in-situ clean up technologies. An assessment of the risks associated with developing contaminated or potentially contaminated land is essential to inform decisions about the appropriate level of treatment, clean up or sustainable remediation that may be required. Sufficient details, prepared by a suitably qualified person, should be provided by the developer to support a planning application. The extent of works required to remediate the site are based on the proposed use of the site. As a minimum the works should result in the site no longer being classed as contaminated under Part IIA of the Environmental Protection Act 1990.*”

Emerging Regional Planning Policy

Draft London Plan 2017

13.2.23 The Draft London Plan, published in December 2017 as a draft for public consultation, “*is a broad plan to shape the way London develops over the next 20-25 years*” and once adopted will replace all previous versions.

13.2.24 Section 1.2.5 states that “*All options for using the city’s land more effectively will need to be explored as London’s growth continues, including the redevelopment of brownfield sites and the intensification of existing places, including in outer London*”.

13.2.25 Policy GG2 states that “those involved in planning and development must... prioritise the development of Opportunity Areas, brownfield land, surplus public sector land, sites which are well-connected by existing or planned tube and rail stations, sites within and on the edge of town centres, and small sites”.

Local Planning Policy

The Kent Minerals and Waste Local Plan (2013-2030) adopted July 2016

13.2.26 Policy CSW 13 of the Kent Minerals and Waste Local Plan (KMWLP) refers to Remediation of Brownfield Land and states that “planning permission will be granted for a temporary period for waste related developments on brownfield land that facilitate its redevelopment by reducing or removing contamination from previous development, where:

- The site is identified in a local plan for redevelopment or has planning permission for redevelopment, or
- The site is part of a network of brownfield sites that are identified in a local plan or local plans for redevelopment or that have planning permission for redevelopment and is to receive waste for treatment from those sites as well as treating the land within the site.”

The London Borough of Bexley Unitary Development Plan

13.2.27 The London Borough of Bexley (LBB) Unitary Development Plan (UDP) was adopted in 2004. In 2007, several UDP policies expired and by 2012, some of the remaining policies were superseded by the adoption of the Bexley Core Strategy in 2012. The remaining saved UDP policies form part of Bexley’s Development Plan Framework until they are replaced by the new Bexley Local Plan.

13.2.28 Policy ENV40 states that “the Council will require applicants to survey sites that are known or suspected to be contaminated to determine the source of any pollutants and any remedial measures necessary to prevent these causing hazards either during construction or through subsequent use of the site. The Council may require applicants to enter into an appropriate legal agreement to ensure that the necessary remedial measures are made”.

The LBB Core Strategy and Guidance in relation to Contaminated Land

13.2.29 Policies CS01 and CS09 of the LBB Core Strategy (2012) set out the vision for development in the Borough in relation to ground conditions matters.

13.2.30 Policy CS01 (Achieving Sustainable Development) states that “sustainable development will be achieved by... maximising the effective and efficient use of natural and physical resources... whilst addressing pollution issues, such as contamination, noise and air quality, to contribute to the health and well-being of the community and the environment”.

13.2.31 Policy CS09, states that the Council will apply “the requirements outlined in national and regional planning policy and guidance to new development, in particular the requirements of the Mayor’s London Plan... [by¹] maximising the opportunities to improve health of the environment (e.g. air, surface water, groundwater and soil quality) and reducing pollution and conflicts between adjoining land uses” and continues within the justification for CS09 that “the Council supports the decontamination and redevelopment of brownfield sites to support new housing and employment growth, particularly in the Thames Gateway growth area”.

13.2.32 The LBB Environmental Protection Team published a guidance document for developers on their website in January 2015 titled ‘A simplified guide to planning applications and land contamination’. This document provides advice relating to the validation of planning applications and includes further explanation about what information should be provided, setting out a tiered approach to the assessment of contaminated land as follows:

Phase 1: Desktop and Walkover Study

Phase 2: Detailed Investigation

Phase 3: Remediation Strategy and Verification report

Dartford Borough Council Development Policies Plan

13.2.33 The Dartford Borough Council (DBC) Development Policies Plan (2017) Policy DP5 – Environmental and Amenity Protection sets out the vision for development in the Borough. Policy DP5 requires that *“Development will only be permitted where it does not result in unacceptable material impacts, individually or cumulatively, on neighbouring uses, the Borough’s environment or public health. Particular consideration must be given to areas and subjects of potential sensitivity in the built and natural environment (including as highlighted on the Policies Map) and other policies, and other potential amenity/ safety factors such as:*

- a) *air and water quality, including groundwater source protection zones;*
- b) *intensity of use, including hours of operation;*
- c) *anti-social behaviour and littering;*
- d) *traffic, access, and parking;*
- e) *noise disturbance or vibration;*
- f) *odour;*
- g) *light pollution;*
- h) *overshadowing, overlooking and privacy;*
- i) *electrical and telecommunication interference;*
- j) *HSE land use consultation zones;*
- k) *land instability; and*
- l) *ground contamination.”*

DBC Contaminated Land Strategy

13.2.34 This strategy, produced in 2001 and updated in 2008, sets out the Council’s approach towards the inspection of land in order to determine the nature and extent of any contamination, and to establish whether the land has been the subject of investigation to determine the extent of any contamination as required under Part 2A of the Environmental Protection Act 1990.

Guidance and Standards

13.2.35 The assessment is underpinned by the following guidance and/or best practice:

- Contaminated Land Report 11 (CLR 11) ‘Model Procedures for the Management of Land Contamination’ (DEFRA/EA, 2004);
- BS 5930:2015 “Code of practice for ground investigations” (BSI, 2015); and,
- BS 10175:2011+A1:2013 “Investigation of contaminated sites – code of practice” (BSI, 2011).

13.2.36 This assessment adopts a tiered approach to ground condition assessment as set out in the aforementioned documents. The assessment also considers the requirements detailed in the Environment Agency’s (EA) “Guiding principles for land contamination” (EA, 2010). The guiding principles documents are a package of three documents (Guiding Principles for Land Contamination (GPLC) 1 to GPLC3) that replaced the EAs ’requirements for land contamination reports’ published in 2005. It should be noted that the GPLC documents were withdrawn at the end of 2015 as part of the measures implemented by the EA as they no longer provide guidance. Whilst regulatory endorsement is no longer in place, these documents still provide useful guidance.

13.3 Consultation

13.3.1 **Table 13.1** below summarises the key consultation responses received to date in relation to ground conditions and how they have been responded to during the EIA process.

Table 13.1: Key Consultation and Responses Relating to Ground Conditions

Reference	Comment	Response
SoS Scoping Opinion		
Section 4.10 – ID 1	In relation to the Electrical Connection route] the Inspectorate is content that the works are unlikely to result in significant effects and therefore this matter is scoped out of the ES.	Electrical Connection route scoped out of this assessment, see Section 13.5 for further details.
Section 4.10 – ID 2	All proposed mitigation and/or necessary remediation should be described within the ES.	Following a Phase 2 intrusive ground investigation, a Tier 2 risk assessment will be undertaken. This assessment will include, where necessary, recommendations for remediation/mitigation and/or further work as found to be appropriate. These recommendations will be carried forward into the ES.
Section 4.10 – ID 3	The method for assessing the significance of potential effects has not been identified within the Scoping Report. This should be included within the ES.	The method for assessing the significance of potential effects is described in Section 13.5 below.
Section 4.10 ID – 4	The Inspectorate has stated that the potential for effects on Abbey Wood SSSI should be assessed within the ES.	The potential effects on this SSSI will be included in the baseline assessments accompanying the ES.
Section 4.10 – ID 5	The Inspectorate has stated that the study area for ground conditions should be described and justified within the ES.	The study area for this assessment is defined in Section 13.5 below.
London Borough of Bexley		
Request for information relating to ground conditions.	PBA requested a search of the Bexley planning records for discharge notices and/or remediation verification reports for the REP site.	Response received, appropriate information will be included in the ES in relation to ground conditions.

13.4 Parameters Used for Assessment

13.4.1 In undertaking the impact assessment as part of the ground conditions assessment, a number of reasonable worst-case scenarios are considered for REP and the Main Temporary Construction Compounds. These include:

- An appraisal of ground conditions pertaining to the REP site and Main Temporary Construction Compounds, noting their natural variability in relation to both thickness and consistency, and the effects of anthropogenic activities that have already occurred at the site, i.e. the nature and extent of made ground;
- Variability of groundwater conditions pertaining to the REP site including, where appropriate, consideration of both tidal and seasonal effects;
- The potential for yet undiscovered contamination to be present on the REP site and Main Temporary Construction Compounds; and
- The extent of development and effects of construction techniques and the extent to which embedded mitigation effects will occur.

13.5 Assessment Methodology and Significance Criteria

Study Area

13.5.1 The study area is defined as the REP site and up to a 1 kilometre (km) radius from it, as based on professional judgement. This is considered to represent the likely zone of influence of any potential significant impacts on ground conditions or from contamination. This study area also includes the Main Temporary Construction Compounds adjacent to Norman Road that would be located within the Application Site. Where impacts have the potential for effects further afield, this (e.g. pollutant pathways such as streams/rivers) has been identified.

13.5.2 In respect of ground conditions, the maximum parameters for the Proposed Development have no bearing on potential significant effects. The predominant differences are the Electrical Connection route options, however the likely limited excavation depth is consistent for each route option. The depth for the electrical connection trench is c. 900 millimetre (mm) except where there is potential for a directional drill, or localised deeper trench, to be required to overcome a specific constraint. The Electrical Connection has already been scoped out of the ES in relation to ground conditions as agreed through the Scoping Opinion.

13.5.3 The Indicative Application Boundary includes an area within the River Thames. However, as there are no (intrusive or non-intrusive) works proposed within this area there is no potential for significant effects on ground conditions. The area has therefore been scoped out of this assessment in relation to ground conditions.

Baseline Data Collection

13.5.4 The assessment of ground conditions at the REP site is being undertaken following a tiered approach as recommended within industry guidance (namely the Model Procedures for the Management of Contaminated Land (CLR11)):

- Tier 1 – Preliminary risk assessment: a qualitative assessment of historical and published information, together with a site reconnaissance, undertaken in order to develop a preliminary conceptual site model and inform a preliminary risk assessment;
- Tier 2 – Generic quantitative risk assessment: an assessment of ground condition data using published generic assessment criteria to screen the site and establish whether there are actual, or potential, unacceptable risks; and (if required); and

- Tier 3 – Detailed quantitative risk assessment: detailed - a quantitative assessment involving the generation of site specific assessment criteria (SSAC).
- 13.5.5 For this preliminary assessment, a Tier 1 qualitative assessment has been undertaken and a Tier 2 assessment is being undertaken to further inform the ES. The requirement (or not) for a Tier 3 assessment will be identified following the completion of the Tier 2 Assessment. The results of the Tier 1 assessment form the basis for the baseline conditions and assessment of effects within this PEIR. The results of the Tier 1 and Tier 2 assessments will form the basis for the baseline conditions and assessment of effects within the ES.
- 13.5.6 It is also recognised that certain soils can be a cause of land instability, either as a result of natural processes or as a result of historical activities such as excavation, resulting in landslides or slips, soil creep, and ground compression. Where there are reasons for suspecting instability, appropriate assessment including site investigations and geotechnical appraisal is undertaken to determine whether:
- The land is capable of supporting the loads proposed to be imposed;
 - The development will be threatened by unstable slopes on or adjacent to the REP site;
 - The development will initiate slope instability which may threaten its neighbours;
 - The REP site could be affected by ground movements due to natural cavities; or
 - The REP site could be affected by ground movements due to past, present or foreseeable future mining or excavation activities.

Assessment

- 13.5.7 The assessment involves a study of available desk based information including: the results of previous soil sampling for investigations; validation reports relating to earlier remediation works undertaken on land within and surrounding the REP site; a review of environmental datasets; regulatory responses to enquiries; and a walkover survey of the Application Site undertaken in March 2018. Preliminary intrusive site investigation is being undertaken to provide further information to enhance the Tier 2 assessment of existing data, and where available this will be reported within the final ES.
- 13.5.8 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology is adopted, with the underlying principle that the identification of pollutant linkages consists of the following three elements:
- A source/hazard (a substance or situation that has the potential to cause harm or pollution);
 - A pathway (a means by which the hazard moves along / generates exposure); and
 - A receptor/target (an entity that is vulnerable to the potential adverse effects of the hazard).
- 13.5.9 The contamination may be a hazard but does not constitute a risk unless all three elements are present (and therefore a pollutant linkage). Therefore, in assessing the potential for contamination to cause a significant effect, the extent and nature of the potential source or sources of contamination must be assessed, any pathways present must be identified, and sensitive receptors or resources identified and appraised. This will result in the determination of their value and sensitivity to contamination related impacts.
- 13.5.10 The methodology adopted in this chapter is qualitative with a progression from factual information (stated with reasonable certainty) regarding the baseline conditions, to appraisal informed by professional judgement and expression of opinions on the relative significance.

13.5.11 Baseline conditions for REP have been identified using a Phase 1 Ground Condition Assessment (GCA) of the REP site, which presents information on the geotechnical and geoenvironmental setting of REP, included as **Appendix I.1**.

13.5.12 The Phase 1 GCA report describes the type and locations of:

- Potential Sources of Contamination (PSCs), based on identification of current and historical land use; and
- Potential Geological Hazards (PGHs), such as ground stability hazards that may result from artificial or natural cavities, and foundation conditions that may be affected by compressibility, shrinkage/swelling of clay stratum and groundwater.

13.5.13 The Phase 1 GCA report also identifies the type and sensitivity of potential receptors (including consideration of human health, buildings, groundwater, surface water and ecological systems) and identification of possible migration or transportation pathways.

Significance Criteria

13.5.14 The significance of the effects is defined using a combination of the value/sensitivity of the potential receptor and the potential consequence of the effect. **Tables 13.2** and **13.3** illustrate how the value of the receptor and the magnitude of the impact are determined, leading to evaluation of the significance level of the effect which can be negligible, minor, moderate, major or substantial.

13.5.15 The classifications have been generated using descriptions of environmental receptor importance and value given in various guidance documents including Guidance for the Safe Development of Housing on Land Affected by Contamination (National House-Building Council (NHBC), 2008) and Department of the Environment, Transport and the Regions (DETR) Circular 02/2000, Contaminated Land: Implementation of Part 2A of the Environmental Protection Act 1990. Human health and buildings classifications have been generated by PBA using the attribute description for each class based on professional judgement.

Table 13.2 Criteria Used in Ground Conditions for Classifying Receptor Value or Sensitivity

Classification	Definition
High Receptor of national or international importance	Human health: Residential and uses where children are present Groundwater: Source Protection Zone Surface water: (General Quality assessment (GQA) Grade A or B High Ecological Status Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage Site or Conservation Area
Medium Receptor of county or regional importance	Human health: Employment Groundwater: Principal aquifer & Secondary A aquifer Surface water: GQA Grade C or D Good or Moderate Ecological Status

	<p>Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) County Wildlife Sites (CWS)</p> <p>Buildings: Area of Historic Character</p>
<p>Low Receptor of local importance</p>	<p>Human health: Transient or Limited Access. Unoccupied/Industrial land use and construction workers*</p> <p>Groundwater: Secondary B aquifer or Unproductive</p> <p>Surface water: Poor Ecological Status</p> <p>Ecology: local habitat resources or no designation</p> <p>Buildings: Replaceable/Local value</p>

* assuming that construction workers will adopt appropriate health and safety and personal protective equipment procedures to be secured through an outline Code of Construction Practice (CoCP) anticipated to be submitted as part of the REP Development Consent Order (DCO).

Table 13.3: Magnitude of Impact in Relation to Ground Conditions

Magnitude	Example	
Large	Adverse	A marked impact that causes a key attribute of the receptor to be lost/degraded.
	Beneficial	A marked improvement in relation to a key attribute of the receptor.
Moderate	Adverse	A noticeable impact that exceeds a standard (for example a Soil Guidance Value (SGV)) but that does not cause a key attribute of the receptor to be lost/degraded.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements or improvement of attribute quality.
Small	Adverse	A discernible impact that is below a standard (for example a SGV) and does not cause a key attribute of the receptor to be lost/degraded.
	Beneficial	A discernible improvement in relation to a key attribute of the receptor.
Negligible/no effect	No discernible impact (either adverse or beneficial) on the receptor.	

13.5.16 The matrix for assigning the significance of effects is presented as **Table 13.4**. Effects of ‘moderate’ significance or above are considered significant in EIA terms.

Table 13.4: Significance of Effects for Assessing Ground Conditions

Sensitivity/Value of Receptor	Magnitude of Impact			
	Large	Moderate	Small	Negligible
High	Substantial	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible/no effect
Low	Moderate	Minor	Negligible/no effect	Negligible/no effect

Limitations

13.5.17 Some of the conclusions in this assessment and the Phase 1 GCA are based on third party data. Where remediation validation reports are not available, assumptions have been made regarding the extent of such work based on agreed remedial strategies. A further assessment of ground conditions pertaining at the REP site, including those areas that were subject to previous remediation, will be the subject of further Phase 2 Ground Investigation and appropriate tiered risk assessment

13.5.18 This assessment is in part based on published information which is generic to the wider area rather than specific to the REP site and Main Temporary Construction Compounds. Where this is the case, professional experience has been used to inform the assessment in terms of likelihood and degree of contamination associated with the identified land uses.

13.5.19 Historical maps and aerial photographs used as part of the studies provide a “snap shot” in time about conditions or activities at the REP site and Main Temporary Construction Compounds, and as such cannot be relied upon as indicators of any events or activities that may have taken place at other times.

13.5.20 It should also be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and man-made effects.

13.6 Baseline Conditions and Receptors

13.6.1 Baseline conditions for the REP site and the Main Temporary Construction Compounds have been identified through the Phase 1 GCA as described above.

REP site

Site History

13.6.2 The Phase 1 GCA has identified the historical land use either partly or wholly within the REP site and immediately adjacent. In summary, this includes a Manure Works, a Fish Guano Works and a Borax Refinery. **Section 3 of Appendix I.1** provides further information.

Current Land Use

- 13.6.3 The REP site is open in character save for small scale ancillary structures and buildings associated with the existing RRRF and includes wetland and wasteland habitat areas, container storage areas and hardstand car parking areas. The existing RRRF main building falls outside of the Application Site, but is encompassed by the REP site.

Geology and Ground Conditions

- 13.6.4 The published geology indicates that the anticipated sequence of strata at the REP site is likely to be Alluvium over River Terrace Deposits and London Clay. However, a review of historical ground investigation reports indicates that a variable thickness of made ground is likely to overlie the natural strata across the REP site.

A number of historical ground investigation and remediation reports were prepared for the development of the existing RRRF that, partly or entirely, cover the REP site. The reports reviewed indicate that some remediation has previously taken place in some parts of the REP site.

Hydrogeology & Groundwater Vulnerability

- 13.6.5 In relation to hydrogeology and groundwater vulnerability, the Alluvium is considered to be a Secondary Undifferentiated aquifer and the River Terrace Deposits are considered to be a Secondary A aquifer. The London Clay is considered to be Unproductive Strata.
- 13.6.6 The REP site is not located within any part of a Groundwater Source Protection Zone (SPZ).

Geoenvironmental Conditions – Soils, Groundwater and Surface Water

- 13.6.7 The Phase 1 GCA identified potential pollutant linkages at the REP site and recommends that intrusive Phase 2 ground investigations should be carried out to inform a quantitative Tier 2 risk assessment and establish the baseline soil, groundwater and surface water conditions. The baseline soil conditions will be updated as part of ongoing Phase 2 intrusive investigation works and will be reported within the ES.

Summary of Potential Receptors

- 13.6.8 Potential Receptors identified for REP have been identified as part of the Phase 1 GCA and are set out in **Table 13.5** below:

Table 13.5: Potential Receptors - REP

Item	Comment
Human Health – Current	REP Workers/Visitors
Human Health – Future	Workers/visitors
Human Health – Off-site	Workers at adjacent industrial park, users of Thames Path
Human Health – Construction	Construction Activities Expected
Groundwater (shallow)	Secondary A aquifer present
Surface Water	River Thames and surface drainage ditches/dykes
Property - Buildings	REP would be considered as a receptor on the basis that the Proposed Development is granted Development Consent
Property - Animal or Crop Effect	Horses are grazed adjacent to this site area
Ecological Systems	On-site wetland and wasteland habitat areas

Item	Comment
	Crossness Local Nature Reserve is located adjacent to this site area

Main Temporary Construction Compounds

Site History

- 13.6.9 The northern half of the Norman Road area (see the 'Data Centre (Consented) areas identified on **Figure 1.3a, Appendix A.1**) was developed initially for residential use around the turn of the 20th Century. Subsequently the whole of this half of the Norman Road area was used for the storage of 'waste' from a Borax refinery to the north of this area, until this material was removed in the late 1980's/early 1990's.
- 13.6.10 The historical maps indicate that the southern half of the Norman Road area was undeveloped until the mid-1950s when a large electrical sub-station was developed. This substation, owned by UK National Grid, was operated until its closure in 2005 and subsequent demolition in 2010/2011.

Current Land Use

- 13.6.11 The northern half of the Norman Road area is currently unused and comprises rough grassland. This area is consented for development as a Data Centre.
- 13.6.12 In the southern half of this area a recently constructed warehouse/industrial unit is present with an associated concrete service yard. There are unused areas of land either side of the warehouse building. Land to the north of the warehouse building has planning consent for a two storey office block and use Class B1 workshop (LPA Reference 12/01930/FUL), while land to its south has planning consent for the erection of a foul water pumping station, electricity substation and meter house (LPA Reference 16/00986/FUL).

Geology and Ground Conditions

- 13.6.13 The published geology (see **Section 4.1.1 of Appendix I.1**) indicates that the anticipated sequence of strata at the Norman Road area is likely to be Alluvium over River Terrace Deposits and London Clay or the Lambeth Group. However, a review of historical ground investigation reports indicates that a variable thickness of made ground is likely to overlie the natural strata across the area.
- 13.6.14 A number of historical ground investigation and remediation reports have been reviewed that were prepared for the Norman Road area, and these indicate that some remediation has previously taken place to remove the borax processing waste. However, the Phase 1 GCA has identified that elevated concentrations of potential contaminants may remain in the soils and groundwater in this area. In addition, the presence of asbestos has been identified in imported fill used to infill areas of excavated contaminated materials.

Hydrogeology and Groundwater Vulnerability

- 13.6.15 In relation to hydrogeology and groundwater vulnerability, the Alluvium is considered to be a Secondary Undifferentiated aquifer and both the River Terrace Deposits and the Lambeth Group are considered to be Secondary A aquifers. The London Clay is considered to be Unproductive Strata.
- 13.6.16 The Norman Road area is not located within any part of a Groundwater Source Protection Zone (SPZ).

Geoenvironmental Conditions – Soils, Groundwater and Surface Water

13.6.17 The Phase 1 GCA identified potential pollutant sources at the Main Temporary Construction Compounds and recommended that either a quantitative Tier 2 risk assessment and further risk assessment in relation to the protection of human health and controlled waters will need to be undertaken, or appropriate mitigation measures would need to be employed to avoid potential impacts. The baseline conditions will be updated as part of ongoing Phase 2 intrusive investigation works and will be reported within the ES. It should however be recognised that additional ground investigation works and assessment may be required in due course to further inform Tier 2 and Tier 3 risk assessment (if required) and the detailed design of any remediation and/or the facility and its construction. These investigations will inform any remediation strategy and mitigation measures to be employed.

Summary of Potential Receptors

13.6.18 Potential Receptors identified for the Main Temporary Construction Compounds as part of the Phase 1 GCA are set out in Table 13.6 below:

Table 13.6: Potential Receptors – Norman Road area

Item	Comment
Human Health – Current	Users of warehouse/office building
Human Health – Future	Workers/visitors
Human Health – Off-site	Users of adjacent nature reserve
Human Health – Construction	Limited Construction Activities Expected
Groundwater (shallow)	Secondary A Aquifer Present
Surface Water	Surface drainage ditches/dykes
Property - Buildings	Existing industrial type building, no new structures proposed – area for construction lay-down
Property - Animal or Crop Effect	Horses are grazed adjacent to this site area
Ecological Systems	Crossness Local Nature Reserve is located adjacent to this site area

Baseline Evolution

13.6.19 In the absence of the Proposed Development and any pollution incidents in the vicinity of the Application Site, it is considered unlikely that there would be any significant change to the baseline ground conditions recorded before the first year of assessment.

13.7 Embedded Mitigation

13.7.1 It is recognised that the development itself will provide embedded mitigation measures such as an outline CoCP anticipated to be submitted as part of the REP Development Consent Order (DCO) and working within best practice guidelines, preventing the release of contamination and therefore negating any effects.

13.7.2 It is recognised that REP and its foundations may result in the removal of ground that may be contaminated, hence resulting in removal of the contamination source.

- 13.7.3 Furthermore, the method of construction may include embedded mitigation such as appropriate piling techniques to minimise the risk of mixing of aquifer bodies through the creation of new pathways. This may include the provision of a Foundation Works Risk Assessment (FWRA) which would be undertaken by the contractor once the proposed foundation solutions are known, and the use of EA guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination' (EA, 2001). A requirement to carry out such an assessment will likely be incorporated into an outline CoCP, which is anticipated to be submitted as part of the REP DCO. Further embedded mitigation will be incorporated into the outline CoCP to reduce exposure to construction dust and vapour.
- 13.7.4 During the operational phases of development, REP would be managed in accordance with the Applicant's existing Environmental Management System, which includes such measures as spill response procedures and requirements for the correct handling of any hazardous substances.

13.8 Assessment of Likely Effects

- 13.8.1 As described in **Section 13.5** the accompanying Phase 1 GCA contains a Tier 1 Preliminary Risk Assessment. This risk assessment describes the risks to various receptors arising from the construction of REP.

The REP Site and Main Temporary Construction Compounds

Construction and Decommissioning

- 13.8.2 It is assumed for the purposes of this assessment that the REP generating equipment would be removed once the plant had ceased operations permanently. Any decommissioning phase is assumed to be of a similar or shorter duration to construction, and therefore environmental effects are considered to be of a similar level to those during the construction phase. It is assumed that the ducting for the Electrical Connection would remain in situ, but that the cables may be removed.
- 13.8.3 From a review of the available desk based information it is likely that the REP site and Main Temporary Construction Compounds is underlain by up to 6.0 m of Made Ground, beneath which are superficial deposits of Alluvium (including Peat) and River Terrace Gravels, to a depth of up to almost 16 m. Beneath the superficial deposits, bedrock of the London Clay formation is present. Historical geoenvironmental testing data from within the REP site and Main Temporary Construction Compounds indicates that the Made Ground (some parts of which are currently capped by either the built environment or, as part of earlier remedial works, a capping layer) may present a potential source of residual contamination to both human health and controlled waters. The underlying alluvial soils also present a potential ground gas source.
- 13.8.4 Potential contamination within the soils and groundwater has the potential to affect construction workers. Historical ground investigations have shown a potential for residual contamination to be present, and including the potential for as yet undiscovered potential sources of contamination, which may cause health impacts as a result of direct or indirect contact with contaminated materials. It is anticipated that, subject to confirmation through additional ground investigations and Tier 2 and 3 assessments as appropriate, implementation of the embedded mitigation described in **Section 13.7** will reduce potential effects below a significant level, and therefore further mitigation is not anticipated at this stage.
- 13.8.5 Pollution releases during construction/decommissioning works have the potential to affect construction workers. During construction works there is potential to introduce new sources of contamination into the environment (for instance; uncontrolled leaks and spills from machinery). To mitigate this potential, no additional measures are required over and above the embedded mitigation referred to earlier in this chapter and that would be included in the outline CoCP, which is anticipated to be submitted as part of the REP DCO. With the implementation of embedded mitigation measures, there are not anticipated to be any significant effects.

- 13.8.6 Site users and off-site human receptors could be exposed to contamination within made ground at both the REP site and Main Temporary Construction Compounds during construction and decommissioning. It is considered that, subject to confirmation through additional ground investigations, and Tier 2 and 3 assessments as appropriate, implementation of the embedded mitigation described in **Section 13.7** will reduce potential effects below a significant level, and therefore further mitigation is not anticipated at this stage.
- 13.8.7 A potential effect of the construction/decommissioning of the REP site would be the mixing of aquifer bodies (groundwater) through the creation of new pathways. The anticipated construction of piled foundations from REP extending through the alluvial deposits into the underlying aquifers (depending on the depth of piling to be adopted) has the potential to introduce new pathways between aquifer bodies. However, no special mitigation measures are considered necessary over and above the embedded mitigation referred to earlier in this chapter. This includes the provision of a FWRA which will be undertaken by the contractor once the proposed foundation solutions are known; EA guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination' (EA, 2001) and a requirement to carry out such an assessment will be incorporated into the CoCP which is anticipated to be submitted with the REP DCO. With the implementation of embedded mitigation measures there are not anticipated to be any significant effects.
- 13.8.8 There is the potential for surface waters to be affected by potentially contaminated run off during the construction and decommissioning of REP and Main Temporary Construction Compounds. With the implementation of the embedded mitigation measures, there are not anticipated to be any significant effects at this stage, subject to confirmation through additional ground investigation and Tier 2 and 3 assessments as appropriate.
- 13.8.9 With the implementation of embedded mitigation measures, impacts to low sensitivity receptors such as property (buildings/animals/crops) are anticipated to result in **Negligible**/no effects. Similarly, impacts to medium sensitivity receptors such as ecological systems are anticipated to result in **Minor Beneficial** effects due to anticipated improvements in the ground conditions.

Operation

- 13.8.10 The operation of the REP is not anticipated to give rise to significant effects to the environment (human health, groundwater, surface water, property, ecological systems) on the basis that it operates in accordance with the Applicant's existing Environmental Management System.

The Electrical Connection and the Cable Route Temporary Construction Compounds

Construction and Decommissioning

- 13.8.11 During construction and decommissioning of the Electrical Connection there is potential for exposure to residual contamination within made ground during construction. Embedded mitigation will be implemented to offset the effects to construction workers which will be included in the CoCP, anticipated to be submitted as part of the REP DCO. Assuming that these measures are implemented, there is expected to be a negligible impact and therefore a **Negligible**/no effect on construction workers. Users of the Electrical Connection and Cable Route Temporary Construction Compounds, as well as off-site human receptors are currently not exposed to potential contamination within any made ground. Although during construction and decommissioning there is potential to expose contamination within made ground, the implementation of the embedded mitigation is anticipated to prevent exposure of site users and off-site human receptors and therefore there is expected to be **Negligible**/no effect on these receptors.
- 13.8.12 Similarly, the development itself (in terms of reducing contaminant loads by removal of made ground material), together with implementation of the embedded mitigation measures, is expected to result in **Minor** effects on both groundwater and surface water.

13.8.13 With the implementation of the embedded mitigation measures, impacts to low sensitivity receptors such as property (buildings/animals/crops) are anticipated to result in **Negligible**/no effects. Similarly, impacts to medium sensitivity receptors such as ecological systems are anticipated to result in **Minor Beneficial** effects due to anticipated improvements in the ground conditions.

13.8.14 At the end of its operational life, it is currently anticipated that the ducting for the Electrical Connection will be left in situ, such that there will be no decommissioning works and therefore no effects.

Operation

13.8.15 The operation of the Electrical Connection is not anticipated to give rise to significant **Adverse** effects to the environment. The Electrical Connection comprises an underground trefoil of cables, and thus potential impacts are associated within the construction and decommissioning phase only.

Summary of Assessment

Construction and Decommissioning

13.8.16 On the basis of the adoption of the embedded mitigation measures described above, the following table summarises the potential effects of construction and decommissioning at the Application Site.

Table 13.7: Summary of assessed Risks related to Construction and Decommissioning phases and assigned potential effects

Item & (Sensitivity)	Magnitude of Impact	Justification	Potential Significance of Effect
Human Health – Site Users (medium)	Negligible/no effect	The proposed construction will cap potentially contaminated areas with permanent cover	Negligible/no effect
Human Health – Off-site (medium)	Negligible/no effect	Mitigation measures to reduce exposure through dust and vapour management	Negligible/no effect
Human Health – Construction (low)	Negligible/no effect	Mitigation measures to reduce exposure through PPE and work practices.	Negligible/no effect
Groundwater (medium)	Small beneficial	The proposed mitigation for pile design will retain the protective properties of the London Clay. In this case the situation would be the same as baseline. The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site, thus negating the benefit. In this case the situation would be the same as baseline.	Minor

Item & (Sensitivity)	Magnitude of Impact	Justification	Potential Significance of Effect
Surface Water (high)	Negligible/no effect	The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement which, if there is connectivity could improve surface water quality. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site, thus negating the benefit. In this case the situation would be the same as baseline.	Minor
Property – Buildings (low)	Negligible/no effect	New buildings to be constructed with mitigation measures as found to be appropriate following investigation.	Negligible/no effect
Property – Animal or Crop (low)	Negligible/no effect	Mitigation measures to reduce exposure through dust and vapour management	Negligible/no effect
Ecological Systems (medium)	Small beneficial	Mitigation measures to reduce exposure through dust and vapour management The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site, thus negating the benefit. In this case the situation would be the same as baseline.	Minor

Operation

13.8.17 On the basis of the adoption of the embedded mitigation measures described, the following table summarises the potential effects of the operation of the Proposed Development.

Table 13.8: Summary of assessed Risks related to Operation phases and assigned potential effects

Item (sensitivity)	Magnitude of Impact	Justification	Potential Effect
Human Health – Site Users (medium)	Negligible/no effect	Development design may incorporate (as found to be appropriate following investigation) gas mitigation, water supply barrier pipes and clean cover in landscaped areas. Removal in part (by construction) of alluvium/peat in areas of deeper construction reduces gassing potential as a consequence of localised source removal.	Negligible/no effect
Human Health – Off-site (medium)	Negligible/no effect	Mitigation measures (where found to be appropriate following investigation) may include clean cover in landscaped areas and hard surfacing which would reduce any contaminated wind-blown particles/dust carried off-site. Removal (by construction) of alluvium/peat reduces gassing potential.	Negligible/no effect
Human Health – Construction (low)	Small adverse	Maintenance workers involving excavation into the ground will adopt mitigation measures to reduce exposure through PPE and work practices.	Negligible/no effect

Item (sensitivity)	Magnitude of Impact	Justification	Potential Effect
Groundwater (medium)	Small beneficial	Appropriate pile design with associated risk assessment to inform design will retain the protective properties of the London Clay. In this case the situation would be the same as baseline. The proposed construction may reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site and negating the benefit. In this case the situation would be the same as baseline.	Minor
Surface Water (high)	Negligible/no effect	It is anticipated that REP will be operated in accordance with the Applicant's existing Environmental Management System which will provide systems of work and mitigation measures to prevent the impacts of contamination of the surface water ditches and dykes surrounding the site and by extension, the River Thames.	Negligible/no effect
Property – Buildings (low)	Small adverse	New buildings will be constructed with mitigation measures as appropriate following investigation and detailed risk assessment and design.	Negligible/no effect
Property – Animal or Crop (low)	Negligible/no effect	Mitigation measures (where found to be appropriate following investigation) may include clean cover in landscaped areas, and hard surfacing which would reduce any contaminated wind-blown particles/dust carried off-site. Removal (by construction) of alluvium/peat reduces gassing potential.	Negligible/no effect
Ecological Systems (medium)	Negligible/no effect	It is anticipated that REP will be operated in accordance with the Applicant's existing Environmental Management System (an operational phase environmental code of practice) which will provide systems of work and mitigation measures to prevent the impacts of contamination of the surface water ditches and dykes surrounding the site and by extension the adjacent Nature Reserve and the River Thames.	Negligible/no effect

13.9 Cumulative Assessment

Construction/Decommissioning

- 13.9.1 Construction and decommissioning of REP could occur simultaneously with other projects located in the vicinity of the Application Site. The 'other developments' with the most potential for simultaneous construction effects are identified in **Chapter 4**. Construction phase mitigation measures will be employed during the construction of the Proposed Development, as such significant adverse cumulative construction effects are not anticipated to be likely. However, this assessment is subject to further detailed assessment, the results of which will be provided within the ES.
- 13.9.2 It is assumed for the purposes of this assessment that the REP generating equipment would be removed once the plant had ceased operations permanently. Any decommissioning phase is assumed to be of a similar or shorter duration to construction, and therefore environmental effects are considered to be of a similar level to those during the construction phase. It is assumed that the ducting for the Electrical Connection would remain in situ, but that the cables may be removed.

Operation

13.9.3 The operation of REP could occur simultaneously with other projects located in the vicinity of the Application Site. The ‘other developments’ with the most potential for simultaneous operational effects are identified in **Chapter 4**. Operational phase mitigation measures will be employed during the operation of REP. As such, significant adverse cumulative operational effects are not anticipated to be likely. However, this assessment is subject to further detailed assessment, the results of which will be detailed within the ES.

13.10 Further Mitigation and Enhancement

Construction/Decommissioning

13.10.1 Following the Phase 2 intrusive ground investigation, a Tier 2 risk assessment will be undertaken. This assessment will include, where necessary, recommendations for remediation/mitigation as found to be appropriate. This may include, amongst other things, further intrusive ground investigation to inform Tier 3 risk assessment if required, the removal/treatment of impacted soils/groundwater, the use of gas protection measures within proposed structures, or the use of a clean capping layer in external areas of the site. Where site specific remediation/mitigation measures are proposed, that are considered to be beyond measures that would be considered to be standard best practice, these will be incorporated into the outline CoCP which is anticipated to be submitted as part of the REP DCO.

Operation

13.10.2 Additional mitigation and enhancement beyond that described above for the construction phase is not anticipated to be required at this stage.

13.11 Preliminary Residual Effects and Monitoring

13.11.1 Until such a time that the intrusive ground investigation and Phase 2 Ground Condition Assessment has been completed, the residual effects (beyond those identified above which include embedded mitigation) cannot be identified. However, it is inherent to the process of managing contaminated land that the completed scheme is designed such that no adverse effects to any receptor (human health, controlled waters, ecology etc.) remain and all residual effects would be, at a minimum, negligible/no effect.

13.12 Summary of Residual Effects

13.12.1 The table below summarises the potential residual effects. It is noted that as stated above, these are subject to further assessment as part of the Tier 2 risk assessment.

Table 13.9: Summary of Residual Effects

Stage	Receptor name and description	Potential mitigation	Preliminary Assessment of Residual Effects
Construction / decommissioning	Human Health – Construction	Mitigation measures to reduce exposure by use of PPE and work practices.	Negligible/no effect

Stage	Receptor name and description	Potential mitigation	Preliminary Assessment of Residual Effects
	Human Health – Site Users	The proposed construction (embedded mitigation) will cap potentially contaminated areas with permanent cover.	Negligible/no effect
	Human Health – Off-site	Mitigation measures to reduce exposure through appropriate dust and vapour management during construction.	Negligible/no effect
	Property – Animal or Crop		
	Groundwater	<p>Appropriate pile design with associated risk assessment will retain the protective properties of the London Clay. In this case the situation would be the same as baseline.</p> <p>The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site and negating the benefit. In this case the situation would be the same as baseline.</p>	Minor beneficial
	Surface Water	The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement which, if there is connectivity could improve surface water quality. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site and negating the benefit. In this case the situation would be the same as baseline.	Negligible/no effect
Construction / decommissioning	Ecological Systems	Mitigation measures to reduce exposure through dust and vapour management.	Negligible/no effect

Stage	Receptor name and description	Potential mitigation	Preliminary Assessment of Residual Effects
		The proposed construction would reduce contaminant loads in the soil and is anticipated to provide a shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site and negating the benefit. In this case the situation would be the same as baseline.	
Operation	Human Health – Construction	Maintenance workers involving excavation into the ground will adopt mitigation measures to reduce exposure through PPE and work practices.	Negligible/no effect
	Human Health – Site Users	Development design may incorporate (as found to be appropriate following investigation) gas mitigation, water supply barrier pipes and clean cover in landscaped areas. Removal in part (by construction) of alluvium/peat in areas of deeper construction reduces gassing potential as a consequence of localised source removal.	Negligible/no effect
	Human Health – Off-site	Mitigation measures (where found to be appropriate following investigation) may include clean cover in landscaped areas and hard surfacing which would reduce any contaminated wind-blown particles/dust carried off-site. Removal (by construction) of alluvium/peat reduces gassing potential.	Negligible/no effect
	Property – Animal or Crop	Mitigation measures (where found to be appropriate following investigation) may include clean cover in landscaped areas, and hard surfacing which would reduce any contaminated wind-blown particles/dust carried off-site. Removal (as a consequence of construction) of alluvium/peat would reduce gassing potential.	Negligible/no effect
	Property – Buildings	New buildings will be constructed with mitigation measures as appropriate following investigation and detailed risk assessment and design.	Minor beneficial

Stage	Receptor name and description	Potential mitigation	Preliminary Assessment of Residual Effects
	Groundwater	Appropriate pile design with associated risk assessment to inform design will retain the protective properties of the London Clay. In this case the situation would be the same as baseline. The proposed construction is anticipated to reduce potential contaminant loads in the soil and as a consequence result in an anticipated shallow groundwater quality improvement. It is possible that the wider groundwater quality is poor and if so this improvement might be short term and temporary due to contaminant migration from off site and negating the benefit. In this case the situation would be the same as baseline.	Negligible/no effect
	Surface Water	It is anticipated that REP will be operated in accordance with the Applicant's existing Environmental Management System which will provide systems of work and mitigation measures to prevent the impacts of contamination of the surface water ditches and dykes surrounding the site and by extension the adjacent Nature Reserve and the River Thames.	Negligible/no effect
	Ecological Systems	It is anticipated that REP will be operated in accordance with the Applicant's existing Environmental Management System which will provide systems of work and mitigation measures to prevent the impacts of contamination of the surface water ditches and dykes surrounding the site and by extension the adjacent Nature Reserve and the River Thames.	Negligible/no effect

13.13 Preliminary Conclusion and Further Assessment

- 13.13.1 Provided specific investigation works and remediation and/or mitigation measures are adopted, the potential effect on all sensitive receptors is, at this stage, assessed to be not significant.
- 13.13.2 It is concluded that the potential effects associated with ground, groundwater and surface water contamination and hazardous ground gases and vapours, do not pose an unacceptable constraint to the Proposed Development.
- 13.13.3 It is also considered that appropriate design and construction methods used for the development will themselves provide mitigation against many of the potential issues and reduce residual impacts to an acceptable level.

13.14 References

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