

12.0 Ground Conditions

12.1 Introduction

- 12.1.1 This chapter of the ES will identify and describe the nature and significance of the potential effects in relation to ground conditions both during construction and the post-construction (or operational) phases of the proposed development at North West Bicester (north east of the Marylebone- Birmingham railway line). Brookbanks (BCL) are appointed to undertake the assessment.
- 12.1.2 The chapter will set out the existing/baseline conditions, summarise the potential direct and indirect impacts of the Proposed Development, the likely mitigation measures required to prevent, reduce or offset the potential impacts and the residual impacts.
- 12.1.3 The study area for the ground conditions chapter will incorporate the site area shown on the site location plan included with Appendix 12.1 plus an appropriate buffer beyond the redline boundary. It is considered that this is the only area that would be affected in terms of ground conditions based on potential sources of contamination and the sensitivity of environmental receptors.

Competence

- 12.1.4 In accordance with the Environmental Impact Assessment (EIA) Regulations (2017) the ES chapter have been carried out by competent experts. Brookbanks is a multi-disciplinary environmental, engineering and development consultancy with many years experience of master developer roles; development management, civil engineering, transport and environmental consultancy. The company has extensive experience and expertise of the EIA process and includes Chartered members of the Institute of Civil Engineers and members of the Institution of Water and Environmental Management.

12.2 Regulatory and Policy Context

National Planning Policy Framework and Planning Practice Guidance

National Planning Policy Framework, 2021

- 12.2.1 The 'National Planning Policy Framework (NPPF) – Planning and Contaminated Land' sets out the legislative background needed for considering development on land affected by contamination. It also provides an overview of the contaminated land regime in England, whilst setting out the roles and responsibilities of local authorities, developers/operators and the Environmental Agency. The document focuses on Part 2A of the Environmental protection act as mentioned above.
- 12.2.2 A comprehensive Geo-Environmental Phase 1 Desk Study has been prepared. The report (Document Ref: BCL Report 10663 DS01 Rv0) is contained at Appendix 12.1.

National Context: DEFRA: Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance

12.2.3 Guidance has been published by the Department for Environment, Food and Rural Affairs (DEFRA), the Environmental Protection Act 1990: Part 2A promotes the 'suitable for use' approach which focuses on the risks caused by land contamination. This approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore need to be assessed on a site-by-site basis.

National Context: Planning Practice Guidance: Contaminated Land (June 2014)

12.2.4 Planning Practice Guidance published in June 2014 by the Department for Communities and Local Government, identifies that contamination is most likely to arise in former industrial locations, however may also occur in other locations as a result of the contamination being moved from its original source. Therefore, as part of any planning application, a geo-environmental appraisal should be carried out to ascertain the level of risk posed by the site and surrounding land uses past and present.

12.2.5 In terms of specifics, the guidance defers matters to the part 2A guidance discussed above.

Other Guidance Documents

12.2.6 In addition to the legislation and policy identified above, the following documents provide relevant guidance on measures to control effects on ground conditions and have been taken into account in this assessment:

- Planning Practice Guidance (2014)
- National Planning Policy Framework (2018)
- Technical Guide to the National Planning Policy Framework (2012)
- CIRIA SP156 - Control of Water Pollution from Construction Sites (2002)
- Environmental Protection Act 1990: Part 2A: Contaminated Land, (2012)
- CIRIA C552 Contaminated Land Risk Assessment, A Guide to Good Practice, (2001)
- CIRIA C665 Assessing risks posed by hazardous ground gases to buildings, (2007)
- CLR 11: Model Procedures for the Management of Contaminated Land.

12.2.7 Published information has been obtained in the form of:

- BGS Published geology
- Environment Agency Data
- Landmark Envirocheck Report

12.2.8 Whilst now archived, in the absence of alternative 'good practice' guidance, it is recognised that the Environment Agency Pollution Prevention Guidance (PPG) notes still provide up to date and appropriate guidance for assessing contamination from Proposed Development.

12.2.9 The guidance documents used in the production of this ES chapter include:

- PPG1: General Guidance to the Prevention of Pollution
- PPG6: Working at Construction and Demolition Sites

Local Policy

Cherwell Local Plan Part 1 2011-2031 (Adopted 2015)

12.2.10 The Cherwell Local Plan Part 1 2011 – 2031, adopted in 2015, is the development plan for Bicester.

12.2.11 The most relevant policies of the Local Plan in relation to Ground Conditions are as follows:

Policy Bicester 1 North West Bicester Development

Policy ESD8 Water Resources

12.3 Assessment Methodology

Overview of Approach

12.3.1 Existing studies/documents, including evidence base studies undertaken in support of the preparation of the Cherwell Local Plan Part A (adopted 2016) have been reviewed to identify the best available data to be taken forward to inform the assessment.

12.3.2 Potential environmental receptors include:

- Human Health
 - Construction/ maintenance workers
 - Future site users; and
 - Neighbouring sites during construction
- Controlled Waters
 - Underlying bedrock aquifer; and
 - The River Bure and its tributaries
- Ecological Systems
 - In any protected locations such as Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Candidate SACs, RAMSAR sites

Scoping and Response

12.3.3 A formal scoping exercise was undertaken to identify the scope of each chapter of the ES. The Councils Scoping Opinion was issued by CDC on 7th October 2021. Having regard to responses from the Environment Agency, the Scoping Opinion affirmed the methodology set out in this chapter.

12.3.4 As a result, the following elements have been **scoped out** of the EIA:

- The effect on statutory or non-statutory sites of geological importance as no sites have been identified in the study area or surrounding area; and
- Impacts on potential mineral resources

12.3.5 The following elements have been **scoped into** the EIA:

- Impacts associated with the potential for encountering potentially contaminated ground during the construction phase; and
- Impacts associated with the potential for contamination during the post-construction phase

Consultations Undertaken

12.3.6 During the development of this chapter, the following bodies and/or document sources and interested parties have been consulted regarding the proposals:

- Environment Agency (EA);
- British Geological Survey (BGS);
- Zetica UXO;

Method for Assessing Baseline and Future Baseline Conditions

12.3.7 The format of this section of the ES follows a standard study pattern, by setting out an appraisal of the baseline conditions, followed by a description of the Proposed Development features and an identification of potential environmental effects due to the Proposed Development. The importance of each mechanism and an assessment of each potential effect are then considered along with any mitigation measures and recommendations for further investigations where necessary.

12.3.8 Methods of assessment have been employed that are consistent with current guidance and recommendations in the form statutory documents and recognised publications to ensure that the findings represent a robust approach to the assessment.

Method for Assessing Impacts and Magnitude and Significance of Effects

12.3.9 The significance of effects will be assessed by considering the sensitivity of receptors (i.e. their importance and ability to tolerate and recover from change) and the likely magnitude of the impact (i.e. its spatial extent and duration). By combining sensitivity and magnitude, the significance of the effect is established.

12.3.10 The significance of an effect will be assessed based upon the sensitivity of the receptor and the magnitude of the change using the matrix presented at Table 12.1.

12.3.11 To assist the assessment of impacts a Conceptual Site Model will be prepared to identify the pathways between historic or future sources of contamination and identified receptors.

Table 12.1 - Determining Significance of Effect

Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Negligible
High	Substantial	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

12.3.12 In the absence of 'industry standard' significance criteria for the consideration of ground conditions impacts, a qualitative approach, based upon available knowledge, experience and professional judgement, will be employed. The significance criteria that will be used for the purposes of the ES chapter are set out in Table 12.2.

Table 12.2 - Guidelines for the Assessment of Significance for 'Ground Conditions'

Significance Level	Description of Consequence
Negligible	Land Contamination: No appreciable environmental risk to water resources, aquatic flora and fauna and humans. Any very low negative effects are reversible. Ground Instability: No effects on ground instability.
Minor Adverse	Land Contamination: Temporary and minor environmental risk to surface water resources, aquatic fauna, flora or air quality. No appreciable risk to humans (construction workers or end users). Ground Instability: Minor (non-structural) damage to building fabric (brickwork / building finishes). Some continued maintenance required to all hardstanding areas. Development will cause localised and very minor slope instability.
Moderate Adverse	Land Contamination: Local environmental hazard to water resources, aquatic fauna and flora, and/ or humans (construction workers and/ or end users) requiring monitoring and local remedial work. Ground Instability: Non-structural damage to buildings but repair requiring services of builder. Weather-tightness of buildings impaired. Loss of functionality of floor slabs. Local damage to service pipes. Some loss of serviceability of roads/ footways requiring repair/ local replacement. Development will cause localised slope instability.
Major Adverse	Land Contamination: End Users at Permanent and major environmental risks. Ground Instability: Major structural damage to buildings, with major repair works required.

Limitations and Assumptions

12.3.13 Third party information has been used in the preparation of this report, which Brookbanks, by necessity assumes is correct at the time of writing. While all reasonable checks have been made on data sources and the accuracy of data, Brookbanks accepts no liability for same.

12.4 Baseline Conditions

Introduction

- 11.4.1 The following paragraphs are based upon data included within an Envirocheck Report, as reported within the Geo-Environmental Phase 1 Desk Study in Appendix 12.1 (Details are appended in this Study).

Historic Land Uses

- 11.4.2 Inspection of the Ordnance Survey maps has revealed that since 1887, the Site has largely remained undeveloped. Two Farms (Lords Farm and Hawkwell Farm) are identified onsite since 1884, along with a building in 1982 in the south-west. In addition, a Track supplying Hawkwell Farm is shown since 1982 across the Site. Bucknell Road splits the Site in the south, and this has been present since 1884. Two Masts, identified in 2021 mapping are present in the south.
- 11.4.3 Since 1900, several quarries have been identified in the south, north-east and north-west of the red line Site, associated with adjacent developments within the vicinity of the Site. However, by the 1970's the majority of these are shown to be disused and built over.
- 11.4.4 The surrounding area is shown to include a number of potentially contaminative land uses. Since 1923, a railway line is shown to bound the south and south-west of the Site. In addition, expansions of Bicester and Caversfield has allowed for associated existing roads, several dwellings and residential areas to have been built or expanded.

Geology

- 11.4.5 With reference to the British Geological Survey map, the majority of the Site is shown to be underlain by limestone of the Cornbrash Formation. Slithers of interbedded limestone and mudstone of the Forest Marble Formation are shown across the Site north, east and south-east.
- 11.4.6 The Superficial geology on site includes Alluvium deposits in east and south-east, consisting of clay, silt, sand and gravel. These appear to follow the watercourse.
- 11.4.7 There are no areas of Artificial Ground/ Made Ground or Landslip areas reported on Site.

Radon

- 11.4.8 The majority of the Site is shown to be situated within an intermediate probability area affected by radon, where between 1 to 3% of homes are estimated to be above the action level. It is reported that no radon protection measures are necessary for the construction of new developments within these areas of the Site.
- 11.4.9 Areas in the north are shown to be in a lower probability area affected by radon, where less than 1% of homes are above the action level. It is reported that no radon protection

measures are necessary for the construction of new developments within these areas of the Site.

11.4.10 Areas to the north are shown to be within an intermediate probability area affected by radon, where between 3 to 5% of homes are estimated to be above the action level. In this location, it is reported that basic radon protective measures are necessary in the construction of new dwellings.

Estimated Soil Chemistry

11.4.11 The Envirocheck report provides the following estimated soil chemistry* on Site, whereby the soil is described as 'rural'.

- Arsenic = 15 – 35 mg/kg
- Cadmium = <1.8 mg/kg
- Chromium = 60 – 90 mg/kg
- Lead = <100 mg/kg
- Nickel = 30 – 45 mg/kg

11.4.12 If required at the detailed design stage, confirmation of the existing site specific soil chemistry can be established via a Phase II ground investigation.

Mining

11.4.13 The Site is not reported to be in an area affected by Coal Mining.

11.4.14 The Envirocheck Report has not highlighted any evidence of Mining Instability on site.

11.4.15 The Site is not reported to be in an area affected by Man-Made Mining Cavities, Natural Cavities or Non Coal Mining Areas of Great Britain.

Minerals

11.4.16 There are three BGS Recorded Mineral Sites recorded within 1,000m of the Site boundary. These are between 138m south-east and 794m south-east from the Site. There are none within the Site.

Hydrology and Hydrogeology

11.4.17 Reference to the online Flood Estimation Handbook shows the Site to lie within the catchment of the River Ray south of Bicester. Part of the drainage network belonging to the River Ray flows through the Site.

11.4.18 EA mapping has identified the majority of the site to lie within Flood Zone 1; being an area of Low Probability of flooding and outside both the 1 in 100 (1% AEP) and 1 in 1,000 (0.1% AEP) year flood events.

- 11.4.19 EA mapping also illustrates that most of the Site has a very low risk of surface water flooding. However, there are small areas across the site that are shown to have a Medium Risk from surface water flooding anticipated to be associated with the stream corridors.
- 11.4.20 The underlying geology highlighted onsite, is shown to form a Secondary A Aquifer. In addition, the superficial Alluvium Deposits onsite are also shown to form a Secondary A Aquifers.
- 11.4.21 The EA's simplified GVZ map, in which the indicative risks on Site vary across the Site, highlights the majority of the Site highlights high vulnerability (Secondary Aquifer) for the Bedrock Geology, with a slither of High Vulnerability (Secondary Aquifer) for the Superficial Deposits.

Contamination

- 11.4.22 There is one Integrated Pollution Prevention and Control within 1,000m of the Site Boundary. This is issued to SSE Heat Networks Limited at Elmsbrook Energy Centre, Epr/Mp3809bm, Elmsbrook Energy Centre, Bramley Avenue, Elmsbrook, Bicester, approximately 32m north-west of the Site for the activity of New Medium Combustion Plant. The effective date given for the permit is the 27th May 2020.
- 11.4.23 One Local Authority Pollution Prevention and Controls have been identified within 1000m of the Site Boundary. This is to Teslayne Engineering, located at Unit 4, The Courtyard, Caversfield, Bicester, approximately 318m north-west of the Site. The current status is "Not Yet Authorised" for Waste Oil Burners, less than 0.4MW net rated thermal input.
- 11.4.24 There are three Pollution Incidents to Controlled Waters recorded within 1,000m of the Site boundary. These are located between 345m east and 751m west of the Site.
- 11.4.25 None of the following have been recorded within 1,000m of the Site boundary:
- Contaminated Land Register Entries and Notices
 - Enforcement and Prohibition Notices
 - Integrated Pollution Controls
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Prosecutions Relating to Authorised Processes
 - Prosecutions Relating to Controlled Waters
 - Registered Radioactive Substance
 - Substantiated Pollution Incident Register
 - Water Industry Act Referrals
- 11.4.26 There are sixty-one Contemporary Trade Directory Entries recorded within 1,000m of the Site boundary. One Trade Directory is identified on-site. This is to Turney Groundcare & Garden

Machinery (Western-on-the-Green Depot) at Western-on-the-Green, Bicester in the east of the Site. The classification for the directory is for Agricultural Engineers with a current "Inactive" status.

11.4.27 Fifteen Trade Directory Entries are identified between 250m from the Site boundary and a further forty-five Trade Directory Entries are located between 251m and 1,000m from the Site.

Hazardous Substances

11.4.28 There are no records of the following on or within a 1,000m radius of the Site boundary:

- Control of Major Accident Hazards Sites (COMAH)
- Explosive Sites
- Notification of Installations Handling Hazardous Substances (NIHHS)
- Planning Hazardous Substance Consents
- Planning Hazardous Substance Enforcements

Waste

11.4.29 The Site is shown to be situated within the Local Authority Landfill Coverage of Cherwell District Council and Oxfordshire County Council, who have both supplied landfill data.

11.4.30 One Historical Landfill Site is recorded within 1,000m of the Site boundary. This is to Gowell Farm, approximately 36m south-east of the Site for Deposited Waste, including Inert, Industrial, Commercial and Household Waste. The first and last input dates are not provided.

11.4.31 One Local Authority Recovered Landfill Site is recorded within 1,000m of the Site boundary. This is located at Gowell Farm, approximately 40m south-east of the Site. The waste in the landfill is defined as Ash, Glass, Brick and Pottery, with an 'Unknown' last reported status. The boundary quality has been defined as 'Good'.

11.4.32 There are ten Potentially Infilled Land (Non-Water) recorded within 1,000m of the Site Boundary. Two are located onsite since 1996 mapping.

11.4.33 There are five Potentially Infilled Land (Water) recorded within 1,000m of the Site Boundary. The nearest is located 664m north-east of the Site.

11.4.34 There are no provided reports of the following within 1,000m of the Site boundary:

- BGS Recorded Landfill Sites
- Historical Landfill Sites
- Integrated Pollution Control Registered Waste Sites
- Licensed Waste Management Facilities (Landfill Boundaries)
- Licensed Waste Management Facilities (Locations)
- Local Authority Recorded Landfill Sites
- Registered Landfill Sites

- Registered Waste Transfer Sites
- Registered Waste Treatment or Disposal Sites

Unexploded Ordnance (UXO)

11.4.35 The Zetica Regional Unexploded Bomb Risk Map for the Site has outlined the proposed development is potentially located within a low Bomb Risk area affected by UXO activity.

Future Baseline Conditions (DO Nothing Scenario)

11.4.36 Should the Proposed Development not come forward the future baseline conditions, as described above, will predominantly remain the same.

11.4.37 In that scenario it is assumed that the site will continue to be farmed in similar way to how it currently operates and that the various features and habitats within the site will remain and will be managed appropriately.

11.4.38 It is anticipated that none of the receptors identified are any more or less sensitive to the potential change in future baseline conditions should the Proposed Development not be delivered

11.5 Assessment of Likely Significant Effects

Construction Effects

Contamination affecting humans

11.5.1 During the construction phase of the Proposed Development, the soil may be disturbed by the use of heavy machinery, excavation, stockpiling and filling which may affect sensitive receptors via pathways such as inhalation, ingestion and direct contact.

11.5.2 The sensitivity of the receptors (residents in adjacent areas, and construction workers) is high and the magnitude of change prior to mitigation is high. There could be direct, short term temporary effects of moderate adverse significance if control and mitigation measures are not employed.

Contamination to Surface Water Conveyance

11.5.3 During the construction phase, there is a risk that the surface water features in the surrounding area may become contaminated; there is also a risk that any standing water within the site may become contaminated.

11.5.4 Sources of contamination could be from on-site activities such as fuel / oil, chemical and waste storage. After disturbing the soil, leaching of contaminants as well as spillages of hazardous contaminants will be exposed to surface run-off which could transport them into nearby surface water features.

11.5.5 The sensitivity of any nearby watercourses is low and the magnitude of change, is low. Therefore, there is likely to be a short term, temporary effect of moderate significance prior to the implementation of mitigation measures.

Contamination of Groundwater

11.5.6 During the construction phase, there is a risk that the concentrations of contaminants in the groundwater in the minor aquifer below the site could increase. Disturbing the soil and piling the site could open pollutant pathways which could leave the aquifers at risk from contamination.

11.5.7 The sensitivity of the receptors is low and the magnitude of change prior to mitigation is moderate. There could be short term, temporary effects of moderate adverse significance if control and mitigation measures are not employed

Contamination affecting fauna and flora

11.5.8 During the construction phase of the Proposed Development, the soil may be disturbed by the use of heavy machinery, excavation, stockpiling and filling which may affect sensitive receptors via pathways such as inhalation, ingestion and direct contact.

11.5.9 The sensitivity of the receptors is low and the magnitude of change prior to mitigation is moderate. There could be short term, temporary and local effects of moderate adverse significance if control and mitigation measures are not employed.

Operational Effects

Impact on new residents

The Exposure of Residential End-Users to Contamination

11.5.10 The sensitivity of the end users is high and the magnitude of change, prior to mitigation, could be moderate in the absence of any mitigation.

Risk to Below Ground Structures from Contaminated Soil

11.5.11 The sensitivity of the Proposed Development is high, and the magnitude of change is low. There is likely to be a permanent effect on the Proposed Development of moderate significance even in the absence of mitigation measures

Risk of Residential and Other End-Users to Ground Gas

11.5.12 The sensitivity of the end users is high and the magnitude of change, without consideration or mitigation is no more than moderate.

Risk to Proposed Soft Landscaping

11.5.13 The use of a cover system for all potentially contaminated areas proposed for landscaping will ensure that there is a negligible impact on the vegetation.

11.6 Mitigation Measures

Mitigation of Construction Effects of Development

- 11.6.1 The potential environmental effect of suspended solids discharging to watercourses and ground waters will be mitigated by adequate site controls developed by way of a Construction and Environmental Management Plan (CEMP). This is likely to be required by planning condition attached to any planning permission and to be agreed with the regulatory authorities prior to implementation. All contractors working on site will be required to adopt the procedures and proposed means of mitigation outlined in the document.
- 11.6.2 In order to minimise the impacts in relation to ground conditions and contamination during development, the CEMP will include the following procedures:
- Prohibition of any temporary construction discharges without approval of the Environment Agency;
 - Earthworks to be completed in a manner that protects the water quality environment and ecological interest of the area. The nature of the works and the proposed implementation methods will be agreed with the Environment Agency in advance and all works will accord with the recommendations of EA Pollution Prevention Guidance for Works in, Near or Liable to Affect Watercourses;
 - Discharges of waters resulting from construction activities will generally be directed to foul sewers, subject to approval of the drainage authority;
 - All fuels oils and potentially contaminating substances to be stored in bunded tanks or suitable hard pave and protected areas as are appropriate;
 - All works will be completed in accordance with the Environment Agency documents, PPG 6 Working at Construction and Demolition sites and PPG21 Pollution Incident Response Planning together with current best practice measures for the management of construction activities; and
 - All surplus construction and demolition materials to be removed from site and reused, recycled, or disposed, in respective order of preference.
- 11.6.3 It will be incumbent on the selected contractor to assess working practice related risks and impacts before implementation and control such as by employing industry good practice techniques. Furthermore, the contractor will be required to develop emergency spillage, flood, fire and contamination control procedures such that any inadvertent incidents are immediately controlled to minimise the potential impact.
- 11.6.4 Site topography is such that limited, if any, earthworks will be required to provide gravity surface water drainage. Filling of the site where necessary will be by way of 'cut and fill' earthworks and imported inert material to trim building levels and highway infrastructure to provide gravity drainage across the site.

11.6.5 Other potential effects relate to the contractor's working practices. For example, there is the potential for fuel oil spillage from stored materials supplying site plant. This potential impact will be controlled by storing such materials within bunded tanks. The works will be completed in a manner that is consistent with the need to protect the surface and ground water quality environment.

11.6.6 The following general mitigation measures will also be adopted as part of the site construction phase to minimise the potential impacts arising from the Proposed Development:

Material Storage

- Storage compounds will be located away from any identified water features;
- Designated bunded "safe" areas will be provided within the compound for storage of oils and other such potentially contaminative materials.

Silt and Earthworking

- Soil mounding to be kept to a minimum to reduce run-off;
- Haul roads to receive regular cleaning to prevent mud build up;
- Careful regulation of wash down processes to avoid washing significant quantities of silt into drains.

Accidental Spillage

- Emergency response requirements to be included in the construction contract requirements;
- Spill kits to be located in all site compounds and near any identified water feature.

11.6.7 All construction phase operations will be carried out in accordance with guidance contained within the Environment Agency Pollution Prevention Guidelines.

Mitigation of Operational Stages of Development

Exposure of Residential End-Users to Contamination

11.6.8 Should it be necessary a cover system could be applied across all proposed areas of soft landscaping in accordance with the BRE document entitled Cover Systems for Land Regeneration, Thickness Design of Cover Systems for Contaminated Land (2004). Such would be sufficient to protect contamination risks to human health. The minimum thickness of clean cover in landscaped areas is 600mm.

Risk to Below Ground Structures from Contaminated Soil

11.6.9 Concrete will be designed and placed in accordance with normal good practice taking account of pH and sulphate concentrations in the ground. Plastic pipes will not be used

where the ground or groundwater contains significant levels of light hydrocarbons or phenol.

- 11.6.10 Results presented in the WRc Investigation indicate that buried concrete in the WRc could be designed for Sulphate Class DS-2 and Aggressive Chemical Environment of Concrete (ACEC) Class AC-2, in accordance with BRE Special Digest 1 (2005). However, testing of soil samples from across the rest of the site, as part of an intrusive geotechnical investigation, should be carried out to allow the correct concrete classification to be recommended.

Risk of Residential and Other End-Users to Ground Gas

- 11.6.11 Gas monitoring wells should be sunk across the site prior to construction to allow levels of hazardous ground gas to be monitored in accordance with current best practice. Gas control measures should be implemented if any hazardous gas is encountered.

Risk to Proposed Soft Landscaping

- 11.6.12 The use of a cover system, as described above, would not only protect human health but also any proposed planting in areas designated for soft landscaping / gardens / vegetation cover. Intrusive investigations would be needed to determine which areas on-site would require these cover systems.

Additional Mitigation

- 11.6.13 Additional mitigation methods may be required dependent upon the assessments undertaken as part of the future geotechnical and contamination intrusive investigation across the site, which should conform to BS5930:1999 Code of Practice of site Investigation (British Standards Institute (BSi), 1999). Additional mitigation methods may also need to be employed should the development plans change in the future.

11.7 Residual Effects

Construction Effects

- 11.7.1 The assessments reported above do not identify fundamental significant adverse effects on or of the development, in the absence of any of the mitigation described above.
- 11.7.2 With the mitigation described above, no significant adverse residual effects are anticipated. Specifically, within the construction phases of development, with mitigation:
- The effects on human activity and health are assessed as being of short term, temporary and negligible
 - The effects of contamination of surface water resources are assessed as being of short term, temporary and negligible

- The effects of contamination of ground water resources are assessed as being of short term, temporary and negligible
- The effects of construction on flora and fauna are assessed as being of short term, temporary and negligible

Operational Effects

- 11.7.3 The assessments reported above do not identify any likely significant adverse effects. No adverse residual effects are anticipated, following mitigation
- 11.7.4 The implementation of sustainable drainage systems within the site boundary will provide a long term beneficial effect by improving water quality and reducing peak rates of run-off from the Site as will the introduction of biodiversity and landscape elements.
- 11.7.5 Accordingly in the operational phases:
- Any Exposure of Residential End-Users to Contamination would be a permanent effect but one of negligible significance following the implementation of mitigation measures
 - Regarding the risk to Below Ground Structures from Contaminated Soil, the sensitivity of the Proposed Development is high and the magnitude of change, following mitigation, is low. Any effect is likely to be a permanent but of minor significance following the implementation of mitigation measures.
 - Regarding the risk arising from ground gas, the sensitivity of the Proposed Development is high and the magnitude of change, following mitigation, is low. Any effect is likely to be a permanent but of negligible significance following the implementation of mitigation measures.

11.8 Cumulative Effects

- 11.8.1 The list of schemes considered as part of the cumulative effects within the ES chapter are listed in section 1.
- 11.8.2 It is anticipated that regulatory control will ensure that developments completed elsewhere in the area will be required to implement measures similar to those outlined above that at least meet current standards. In such circumstances, the environmental effects resulting from the development will be negligible.

11.9 Summary Statement of Effects

- 11.9.1 Pre-mitigation impacts are identified above.
- 11.9.2 The potential significance of the impacts assumes that the mitigation measures outlined above have been implemented and are fully in accordance with current guidance and the requirements of the regulating authorities.

Table 12.3: Assessment of Significance of Residual Effects

Possible Effect	Duration	Significance Major/Moderate/ Minor/Negligible Beneficial/Adverse	International/ National/ Regional/ Local	Mitigation	Residual Effect
Construction					
Human	Temporary	Moderate Adverse	Local	CEMP	Negligible
Surface Water Conveyance	Temporary	Moderate Adverse	Regional	CEMP	Negligible
Groundwater	Temporary	Moderate Adverse	Regional	CEMP	Negligible
Fauna/Flora	Temporary	Moderate Adverse	Local	CEMP	Negligible
Operational Development					
Residential End Users	Permanent	Moderate Adverse	Local	Cover Systems	Negligible
Ground Structures	Permanent	Moderate Adverse	Local	Good Practice.	Minor Adverse
Ground Gas	Permanent	Moderate Adverse	Local	Good Practice and Monitoring	Negligible
Soft Landscaping	Temporary	Minor Adverse	Local	Cover Systems	Negligible