AtkinsRéalis

Volume 2, Chapter 10 – Ground Conditions and Contamination

Manchester City Council

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FORMER CENTRAL RETAIL PARK – THE PARK

AtkinsRéalis - Sensitive / Sensible

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Contents

11. Ground Conditions and Contamination 4

11.1 Executive summary 4
11.2 Introduction 4
11.3 Competent expert evidence 4
11.4 Relevant legislation and guidance 5
11.5 Assessment method 6
11.6 Baseline conditions 9
11.7 Potential impacts 15
11.8 Assessment of effects 16
11.9 Additional mitigation and enhancement measures 18
11.10 Cumulative effects 18
11.11 Summary and conclusions 18
11.12 Glossary and acronyms 18

Tables

Table 11-1 - Assigning Receptor Sensitivity- Physical effects 6
Table 11-2 - Assigning Magnitude of impact-physical effects 6
Table 11-3 - Assigning Significance of effect-Physical effects 7
Table 11-4 - Classification of effects-Physical effects 7
Table 11-5 - Estimate of land contamination risk by comparison of consequence and probability 7
Table 11-6 – Classification of effects – land contamination 8
Table 11-7 - Summary of Historical Development 9
Table 11-8 - Summary of Pollution Incidents 12
Table 11-9 - Initial Conceptual Site Model – Existing conditions 14
Table 11-10 Construction phase impact assessment 16
Table 11-11 Operational phase impact assessment 16
Table 11-12 – Glossary and acronyms 18

Figures

No table of figures entries found.

11. Ground Conditions and Contamination

11.1 Executive summary

The Site currently comprises hardstanding following the demolition of the former retail park in 2019. The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street. Ground investigations undertaken by e3p did not identify any exceedances of the human health screening criteria when screened against a commercial end-use. No exceedances of both the DWS and EQS identified by e3p. The Site was classified as having a very low gas hazard potential from ground gas.

The general approach to the ground conditions and contamination assessment comprised:

- Determining the baseline conditions for the study area with the recent ground investigation information;
- Identification of potential impacts on identified resources and receptors from the construction and operational phases of the Proposed Development;
- Assessment of the significance of likely impacts and effects from the Proposed Development including the consideration of embedded mitigation;
- Identification of any additional mitigation measures or enhancements and residual effects; and
- Identification of any cumulative effects.

The approach for soil erosion, soils re-use and waste soils was based on a qualitative approach considering the effects of the construction and operation phases of the Proposed Development. The assessment was informed by the works required and the construction and operation methods proposed at the time of reporting. The effects were classified using the sensitivity of the receptors and magnitude of the impact and the significance of the effect identified.

The approach for land contamination was based around two stages: a contamination risk assessment and then a contamination impact assessment. The Stage 1 contamination risk assessment was based on LCRM and the Good Practice Guide to EIA, with risk assessments developed for baseline, construction and operational phases. The level of risk was then ascertained by the estimation of probability and consequence of the risk in accordance with CIRIA C552[1]. The Stage 2 contamination impact assessment involved individual comparisons between the baseline risk assessment and the construction and operational phase risk assessments.

A number of embedded mitigation measures are assumed to be incorporated into the design of the Proposed Development, including that the design will be completed in accordance with current authoritative legislation, statutory guidance and best practice, design of drainage to consider risks from contamination, additional assessment of unexploded ordnance risk, mitigation to reduce impacts from soil erosion, derivation of suitable soils re-use criteria and appropriate chemical testing on soils re-used on-site including in areas of soft landscaping, implementation of a Materials Management Plan, maximising re-use of site-won soils and minimising importation of soils.

Environmental impacts are likely to be greatest during constriction, with reduced impacts likely during operation. Negligible to minor effects have been identified on soil erosion, land contamination, soils re-use and waste soils through the assessment process. These are classed as not significant.

The environmental assessment presented in this chapter has concluded that, throughout the construction and operational phases, there will be no significant effects on ground conditions and contamination. Residual effects during construction or operation are not anticipated.

11.2 Introduction

This chapter of the Environmental Statement (ES) assesses the likely effects of the Proposed Development on ground conditions and contamination. The chapter also describes the assessment method, the existing baseline conditions, potential impacts, assessment of effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects, the likely residual effects after these measures have been employed; and the 'Type 2' (Inter-project) cumulative effects associated with the Proposed Development in combination with other developments within 250 m of the Site.

Type 1 cumulative effects 'intra-project effects' which are the combined effects of individual topic impacts on a particular sensitive receptor are considered in ES (Volume 2) Chapter 20: Cumulative Effects.

This chapter is supported by a technical appendix contained within ES (Volume 4) Appendix 11.1, which includes the following:

- E3P Phase1 and 2 geo-environmental site assessment; and
- Definitions of probability and consequence for land contamination.

11.3 Competent expert evidence

This ground conditions and contamination assessment has been undertaken by:

- A Junior Environmental Consultant who has 2 years of knowledge and experience from contracting and consulting gaining, an understanding in ground conditions and contamination assessment and have used their knowledge and professional judgement to undertake this assessment.
- An Environmental Consultant with 6 years of knowledge and experience in ground conditions and contamination assessments and have used their knowledge and professional judgement to undertake this assessment.
- A Chartered Environmentalist (BSc, CEnv) who holds full professional membership with the Institution of Environmental Sciences. They have over 18 years of knowledge and experience in ground conditions and contamination assessments and have used their knowledge and professional judgement to undertake this assessment.

[1] CIRIA (2001) Contaminated land risk assessment. A guide to good practice (C552) https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C552&Category=BOOK [Accessed on 06 January 2024]

11.4 Relevant legislation and guidance

11.4.1 National planning policies and legislation

National Planning Policy Framework (NPPF)[2] 2021

The NPPF sets out the Government's interpretation of the planning system and identifies main policy objectives and principles. In relation to ground conditions, paragraph 183 of the NPPF states local planning policies and decisions should ensure that:

- The site is suitable for its proposed 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 proposed land remediation;
- After remediation, as a minimum, land should not be capable of being determined as Contaminated Land as defined under Part 2A of the Environmental Protection Act (as amended); and,
- Adequate site investigation information, prepared by a competent person, is available to inform these assessments.

Environmental Protection Act (EPA), 1990[3]

The EPA defines the fundamental structure and authority for waste management and control of emissions into the environment within England, Wales, and Scotland.

Part 2A of the EPA introduced a statutory regime for the identification and remediation of 'Contaminated Land'. It introduced, for the first time in the UK, a statutory definition of 'Contaminated Land' based on significant harm or the likelihood of significant harm (including risks to human health) or the pollution or likely pollution of controlled waters.

Contaminated Land (England) Regulations, 2006[4]

Makes provision for the identification and remediation of contaminated land under Part 2A of the EPA 1990.

The Water Environment (Water Framework Directive (WFD) (England and Wales) Regulations, 2017[5]

These regulations establish a framework for the protection of groundwater. It requires environmental objectives be set to ensure that good status of groundwater is achieved and that its deterioration is avoided. This includes that;

- any upward sustaining trend in the concentration of a pollutant must be identified and reversed;
- a good status of groundwater requires early action and stable long-term planning of protective measures, owing to the natural time lag in its formation and renewal; and
- monitoring programmes should cover monitoring of the chemical and quantitative status of groundwater.

River Basin Management Plan (2022)[6]

Describes the framework used to protect and improve the quality of waters in each river basin district.

Wildlife and Countryside Act, 1981[7]

Sets out the legislative framework for the protection of geological features of special interest.

11.4.2 Regional and local planning policies

Manchester City Council Local Plan 2012-2027

- Policy EN15 Protecting Designated Biodiversity and Geological Conservation – developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity.
- Policy EN17 Water Quality – development should avoid adverse impacts on water quality, minimise surface water run-off, maximise use of sustainable urban drainage systems, minimise groundwater contamination and avoid pollutants reaching watercourses.
- Policy EN18 Contaminated Land and Ground Stability – the Council will give priority for the remediation of contaminated land to strategic locations.

Places for Everyone Joint Development Plan[8]

The Places for Everyone (PfE) plan provides objectives and guidance policies to help create inclusive and sustainable economic growth across nine boroughs. It reinforces the ambition to bring forward development on brownfield land and provide greater protection of environmental assets whilst also supporting wider strategies around clean air, walking and cycling and underpins the ambition to be a carbon neutral city region by 2038. Specifically, the plan contains a Sustainable Development policy (JP-S1) which addresses the need to consider land contamination and stability, particularly in relation to previously developed sites for development.

11.4.3 Guidance

Contaminated Land Statutory Guidance, 2012[9]

Assist with deciding whether land is legally defined as "contaminated land".

It also elaborates on the remediation provisions of Part 2A, such as the goals of remediation, and how regulators should ensure that remediation requirements are reasonable.

Land Contamination Risk Management (LCRM), 2023[10]

The overarching process used to ensure a site or development will not present unacceptable risk to those occupying, using or otherwise affected by it.

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[2] National Planning Policy Framework - Guidance - GOV.UK (www.gov.uk)

[3] Environment Agency (in this Part 2 A (Environmental Protection Act 2020) Environmental Protection Act 1990 (legislation.gov.uk) [Accessed 13 March 2024].

[4] Gov.uk (2006) https://www.legislation.gov.uk/uksi/2006/1380/introduction [Accessed 13 March 2024].

[5] Gov.UK (2017) The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (legislation.gov.uk) [Accessed 13 March 2024].

[6] Environment Agency (2022) River basin management plans: updated 2022 - GOV.UK (www.gov.uk) [Accessed 13 March 2024].

[7] Gov.UK (1981) Wildlife and Countryside Act 1981 (legislation.gov.uk) [Accessed 13 March 2024].

[8] https://www.greatermanchester-ca.gov.uk/media/9578/places-for-everyone-joint-development-plan-document.pdf

[9] Department for Environment & Rural Affairs (2012) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf [Accessed 13 March 2024].

[10] Environment Agency (2023) Land contamination risk management (LCRM) - GOV.UK (www.gov.uk) [Accessed 13 March 2024].

BS 10175:2011+A2:2017 (2017)[11]

Recommendations and guidance on the investigation of land that could potentially be affected by contamination.

Planning Practice Guidance 'Land affected by contamination'[12]

With regard to contamination the implications of contamination for a new development should be considered by the local planning authority to the extent that is not addressed by other regimes. Whilst responsibility for securing a safe development rests with the developer and/or landowner, the PPG states that local planning authorities should be satisfied that a Development, along with any necessary remediation works or proposed mitigation measures, will be appropriate for its location and not pose an unacceptable risk.

With regard to land stability, PPG identified that the planning system has an important role in; minimising the risk and effects of land stability, ensuring that specific types of development are not placed in unstable locations without suitable precautions being implemented and should wherever possible bring unstable land back into productive use.

CIRIA C552

Sets out the risk assessment process by describing the stages involved in identifying contaminated land hazards, defining probabilities of the risk occurring and consequences if the risk occurs and then defining the overall contaminated land risks.

11.5 Assessment method

11.5.1 Study Area

To consider the effects of the Proposed Development on ground conditions and contamination, the study area is defined as the area within the Proposed Development boundary (the Site) and land immediately beyond up to a distance of 250 metres (m).

11.5.2 Methodology

The general approach to the ground conditions and contamination assessment comprises:

- Determining the baseline conditions for the study area with the recent ground investigation information;
- Identification of potential impacts on identified resources and receptors from the construction and operational phases of the Proposed Development;
- Assessment of the significance of likely impacts and effects from the Proposed Development including the consideration of embedded mitigation;
- Identification of any additional mitigation measures or enhancements and residual effects; and
- Identification of any cumulative effects.

Physical Effects, Soils Re-use and Waste Soils

The assessment of the potential physical effects (soil erosion) and the effects associated with soil re-use and waste soils has been undertaken using a qualitative approach considering the effects of the construction and operation phases of the Proposed Development. In addition, high level comments are provided in Section 11.7 and 11.8 in relation to ground stability / subsidence, soil compaction, faults, mining, changes in topography and effects on geology as a valuable resource.

The baseline information in relation to ground conditions of the study area has been reviewed and considered in the context of construction and operation of the Proposed Development and methods to determine if impacts are likely. The assessment is informed by the works required and the construction and operation methods proposed at the time of reporting including enabling and temporary works, earthworks, proposed foundations and structures, and construction methods. Where information is not available, appropriate assumptions based on similar sites have been used.

The impacts have then been assessed using the sensitivity of the receptors and magnitude of impact to consider the significance of the effect as described further below. A sensitivity has been assigned to each receptor using the criteria detailed in Table 11-1. Where the attribute falls within two sensitivity criteria, the worst-case sensitivity is selected.

Table 11-1 - Assigning Receptor Sensitivity- Physical effects

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

Following determination of the sensitivity of the receptors, the magnitude of potential impacts are determined. The criteria for the assessment of impact magnitude for physical effects and effects associated with waste soils and soil re-use are defined in Table 11-2.

Table 11-2 - Assigning Magnitude of impact-physical effects

Magnitude of Impact	Description
High	Total loss of major alterations to one or more of the key elements, features or characteristics of the baseline. The situation will be fundamentally different.

[11] BSI (2017) BS 10175:2011+A2:2017 Investigation of potentially contaminated sites, Code of practice.

[12] Gov.UK (2019) Land affected by contamination - GOV.UK (www.gov.uk) [Accessed 13 March 2024].

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

The overall potential significance of physical effects and effects associated with waste soils and soil re-use is defined using the matrix presented in Table 11-3 below, which describes the relationship between the sensitivity of the receptor and the magnitude of the potential impact.

Table 11-3 - Assigning Significance of effect-Physical effects

		Magnitude of impact (degree of change)			
		Very Low	**Low**	**Medium**	**High**
Sensitivity of receptor	**Very Low**	Negligible	Negligible	Minor	Minor
	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

Physical effects and effects associated with waste soils and soil re-use are described as adverse/negative or beneficial/positive, major, moderate, minor or negligible considering the sensitivity of the receptor, area over which the impact may occur, whether the impact is direct or indirect, the duration of the impact (short-term: less than three years; medium term: three to ten years; or long-term: more than ten years), and whether the impact is permanent or temporary. The categories of physical effects are described in Table 11-4.

Table 11-4 - Classification of effects-Physical effects

Classification	Effect
Major adverse	Major soil erosion, soil compaction or ground instability that is permanent in nature. The generation of major volumes of soils classified as hazardous waste requiring off-site disposal.
Moderate adverse	Moderate soil erosion, soil compaction, or ground instability that is either permanent or long-term in nature. The generation of moderate volume of waste requiring off-site disposal.
Minor adverse	Limited medium-term soil erosion, soil compaction, or ground instability. The generation of a minor amount of waste soil requiring off-site disposal
Negligible	No measurable impact on soil erosion, soil compaction, waste volumes, or ground instability or impacts that are only temporary in nature (less than three years).
Minor beneficial	Limited medium-term reduction in existing soil erosion, soil compaction, or ground instability issues. A minor amount of materials re-use on-site, thereby reducing off-site disposal volumes
Moderate beneficial	Moderate permanent or long-term reduction in existing soil erosion, soil compaction, or ground instability issues. A moderate amount of materials reuse as part of the development, thereby reducing off-site disposal volumes by a significant extent
Major beneficial	Major permanent reduction in existing soil erosion, soil compaction or ground instability issues. Sustainable reuse of materials on-site with no, or only minimal, off-site disposal of waste soils.

Following the classification of an effect, a clear statement is made as to whether the effect is 'significant' or 'not significant'. For physical effects, soil reuse and waste soils, major and moderate effects will be classed as significant and minor and negligible effects not significant, in accordance with standard EIA practice. However, professional judgement is also applied where appropriate.

Land Contamination effects

The assessment of the potential impacts of the Proposed Development on land contamination has considered the risks to various receptors from land contamination and the change in this risk profile during construction and operation. The assessment has been undertaken over two stages:

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

Stage 1 – Contamination Risk Assessment

The approach for the Stage 1 contamination risk assessment is based on LCRM and the Good Practice Guide to EIA. The process entails the development of an initial CSM from the baseline information and subsequent CSMs for the construction and operational phases considering the potential sources, pathways and receptors present.

The level of risk has been ascertained by the estimation of probability and consequence of the risk in accordance with CIRIA C552[13]. Definitions of probability and consequence, as presented in CIRIA C552, are provided in Volume 3, Appendix 11.1 and the level of risk is identified using Table 11-5.

Table 11-5 - Estimate of land contamination risk by comparison of consequence and probability

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability / Likelihood	**High Probability**	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Probability	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk

[13] CIRIA (2001) Contaminated land risk assessment. A guide to good practice (C552) https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C552&Category=BOOK [Accessed on 06 February 2024]

	Consequence			
	Severe	**Medium**	**Mild**	**Minor**
Unlikely	Modera/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Stage 2 – Contamination Impact Assessment

The approach to the contamination impact assessment entails undertaking land contamination risk assessments as described above for each of the following:

- **Baseline stage:** development of an initial CSM for the Site based on its current sources, pathways and receptors and an assessment of the current land contamination risks.
- **Construction stage:** development of the predicted CSM and risk assessment for the construction phase, addressing the potential for new sources of contamination to be introduced to the Site and the change in pathways and receptors.
- **Operational stage:** the predicted CSM for the Proposed Development, reflecting the final Site conditions including the status of contamination sources and the changes in the receptors.

The impact assessment then involved comparison of the baseline risk assessment with the construction phase and operational phase risk assessments. This approach enabled changes in the contaminated land status during each phase to be identified, an assessment of the effects to be made and appropriate mitigation measures specified.

The effects of the Proposed Development are then described as adverse/negative or beneficial/positive, major, moderate, minor or negligible as detailed in Table 11-6.

Table 11-6 – Classification of effects – land contamination

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

Following the classification of an effect, a clear statement has been made as to whether the effect is 'significant' or 'not significant'. For land contamination, major and moderate effects will be classed as 'significant' and minor and negligible effects as 'not significant' in accordance with standard EIA practice.

It should be noted that, given the information known at the time of writing, professional judgement has been applied in certain circumstances where the introduction or removal of a receptor or pathway has automatically triggered a minor adverse or minor beneficial effect.

Initial Conceptual Site Model and Risk Assessment

Primary guidance for assessing and managing land contamination is presented in Land Contamination Risk Management (LCRM)[14] and BS 10175:2011+A2:2017[15] . This guidance provides a technical framework for identifying and remediating contamination through the application of a risk management process. The question of whether risk is unacceptable in any particular case involves not only scientific and technical assessments, but also appropriate criteria by which to judge the risk and conclude exactly what risk would be unacceptable.

An initial Conceptual Site Model (CSM) has been developed, based on available information, to assist in the assessment of the potential land contamination. The initial CSM describes the relationship between potential sources of contamination (resulting from both on and off-site historical and recent activities) and receptors to the potential contamination. As part of the initial CSM development, three elements are identified and assessed:

- Source of contamination and associated contaminants;
- Receptors (human beings, controlled waters and ecological systems) to contamination; and
- Pathways between the sources and receptors. Where all three elements are present or are likely to be present, they are described as potential contaminant linkages (pcls), which can then be subjected to the risk assessment and risk management process.

Initial Conceptual Site Model

An initial CSM has been developed along with a preliminary risk assessment with respect to each identified PCL and current Site conditions (baseline stage) and is presented below. The preliminary risk categorisations presented are based on an assessment of the potential consequence of each PCL occurring along with the likelihood that each PCL will occur. Potential contaminants have been identified through reference to Department of the

[14] Land Contamination Risk Management guidance, Land contamination risk management (LCRM) - GOV.UK (www.gov.uk) [Accessed 12 February 2024]

[15] BSI, BS10175:2011+A2:2017, Investigation of potentially contaminated sites: Code of Practice

Environment (DoE) Industry Profiles[16] for land uses on or adjoining the Site where appropriate and other authoritative guidance.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015[17] which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps are taken to eliminate / manage that risk. It has been assumed that any future construction and maintenance works on-site will be undertaken in compliance with these requirements, and as such, have been discounted from the initial CSM.

Risk Estimation

Through consideration of the potential consequence and probability / likelihood of exposure occurring, a potential risk rating for each PCL has been assigned and is presented in **Error! Reference source not found.** The purpose of this assessment is to focus upon the potential risks present, based on the existing Site use. The definitions of estimated risk are taken from CIRIA C552[18] and are summarised below. The definitions of consequences and probabilities for each receptor are provided in Volume 3, Appendix 11.1. The risk is evaluated through the probability matrix presented in Table 11-5.

11.5.3 Assumptions and limitations

Assumptions on ground conditions and contamination impacts has been made based on the data available at the time of reporting and current understanding of the Proposed Development. Information for ground conditions and contamination has been sourced from available desk-based information plus relevant ground investigation data for the Proposed Development obtained by e3p in 2017 [19].

This chapter provides an initial indication of chronic long-term risks to construction and maintenance workers. Short-term acute risks should be assessed, managed and mitigated by the Contractor with appropriate risk assessments and methods statements, and subsequent control measures.

11.6 Baseline conditions

11.6.1 Future anticipated baseline

The Site is situated on the site of the Former Central Retail Park (FCRP) which was demolished in 2019 and the site cleared down to ground level. For the purpose of this assessment, the baseline has been identified as, a bare plot of land with earthworks completed within the central corridor of the Site and hardstanding remaining in the dog leg of the Site parallel to Great Ancoats Street and the Cotton Field Park interface comprising its existing conditions. This is attributed to the fact the Phase 1 development are completing all earthworks within the central corridor prior to the construction of the Proposed Development but not the remaining areas of the Site.

11.6.2 Historical Development

The history of the study area has been determined principally by reference to the historical maps dated from 1848 to 2023 presented in the Groundsure Report[20], as well as the Phase I and II Geo-environmental Site Assessment report previously prepared by e3p. A summary of the historical development is shown in Table 11-7 below.

Table 11-7 - Summary of Historical Development

Map and scale	On-Site	Off-Site (within 250 m)
1848 1:10,560 to 1851 1:1,056	The earliest available mapping for the Site shows it to be located within an urban setting with terraced residential homes and other buildings occupying south of the Site and an Iron Works present in the centre and north of the site. The Iron Works extends off-site to the east.	The surrounding area is mapped as a mix of residential, commercial and industrial uses. Ancoats Street runs parallel to the south of the Site. A coal yard and parts of Allum Street Mill and Allum Street Foundry are located on the north-eastern site boundary and beyond. A smithy, cotton mill, spindle works, coal wharf, timber yard, iron works with associated boilers, brewery, chimneys, cranes, weighing machines and canals are mapped present approximately 20 m to 150 m north of the site boundary. A timber yard, wire mill, Shooters Brook Iron Works, coal wharf, colliery wharf and associated cranes and weighing machines are mapped present within 250 m of the southern and south-east site boundary.
1891 1:500 1889 to 1893 1:2,500	No significant changes.	No significant changes mapped, although a lot of the industrial buildings surrounding the site are not named.
1894, 1896 & 1906 1: 10,560	No significant changes.	A clothing factory and disused foundry are mapped present to the south of the site.
1908 1:2,500	A Timer Shed and Tin works are now shown to be present in the former location of the Iron Works.	Long Mill, Old Mill, Sedgewick Cotton Mill; Murray Street Mill, cotton works, Corporation Yard and Stone Wharf, sawmills, hydraulic power station, tin works, iron & steel warehouse, tarpaulin works, timber yard, wharfs, clothing factory, dye works, glass works, engineering works, galvanizing works, chemical works, flour mill, waterproof factory, timber shed, bedstead and safe works are located surrounding the Site.
1922 1:2,500 1923 1:10,560	No significant changes.	No significant changes.
1931 to 1932	The Tin works is no longer present on site.	A lot of the previous industrial uses are still mapped as present with the addition of a sheet metal works, wastepaper

[16] Department of the Environment (DoE) Industry Profiles, published 1995 https://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/198-doe-industry-profiles [Accessed 12 February 2024]

[17] Health and Safety Executive – The Construction (Design and Management) Regulations 2015 https://www.hse.gov.uk/construction/cdm/2015/index.htm [Accessed 12 February 2024]

[18] CIRIA C552 – Contaminated land risk assessment, a guide to good practice.

[19] e3p, 2017, Phase I and Phase II Geo-Environmental Site Assessment

[20] Groundsure (2023) GS-N5Y-Y5P-M5I-37U

Map and scale	On-Site	Off-Site (within 250 m)
1:2,500		works, additional clothing mills / factories, cabinet works, and machine tools works within 250 m of the Site.
1934 to 1938 1:1,10,560	No significant changes.	No significant changes.
1952 to 1955 1:2,500	No significant changes.	The majority of the industry remains present with the addition of an electricity sub-station, brass and iron works (Union Works) builders' yard, soap works, corporate cleansing department, and paint works. The canal / basin to the north has changed in configuration.
1956 to 1968 1:10,560	No significant changes.	No significant changes.
1963 to 1969 1:2,500	The Timber Shed is now labelled as a Saw Mill.	No significant changes.
1978 1:1,250	No significant changes.	A lot of the industry noted present to the north-east of the Site has now been replaced by St Jude's Primary School located on the northern Site boundary and housing approximately 100 m north of the Site. The canal / basin to the north is no longer mapped present.
1981 to 1985 1:10,000	No significant changes.	Some further conversion of the industrial buildings to smaller residential buildings to the north-east.
1983 to 1985 1:2,500	The Saw Mill is no longer present on site	No significant changes.
1985 1:10,000	No significant changes.	No significant changes.
1990 to 1995 1:2,500	Maps show that the Site has been redeveloped as part of the "Central Retail Park".	Adjacent land to the west and east has been redeveloped as part of the "Central Retail Park".
1991 to 1994 1:10,000	No significant changes.	No significant changes.
2001 1:10,000	No significant changes.	No significant changes.
2003 1:2,500	No significant changes.	No significant changes.
2010 1:10,000	No significant changes.	No significant changes.
2023 1:10,000	No buildings are mapped present on Site.	The former buildings of the Central Retail Park are no longer mapped present.

11.6.3 Geology

Geological designate sites

There are no sites of geological interest, Local Geological Sites (LGS) formerly known as Regionally Important Geological Sites (RIGS)[21], or geological SSSIs within the study area. There are also no sensitive / valuable non-designated geological features within the study area.

Mapped Geology

Reference to the Groundsure report indicates that no Made Ground or artificial ground is noted present beneath the site. However, given the historical development of the Site and wider study area Made Ground is anticipated to be present.

The Groundsure report indicates the Site is underlain by Devensian Till comprising 'a heterogenous mixture of clay, sand and gravel'. The bedrock underlying the Site comprises the Chester Sandstone Formation.

BGS borehole logs

There are three BGS borehole logs noted present on Site and an additional 64 borehole logs within the study area. The borehole logs noted on Site were completed in 1999 and relate to the construction of St Jude's School to the north and are between 0.91 m and 4 m deep. TP25 and TP25A generally describe gravelly Made Ground of brick, limestone and sandstone up to 1.0 m below ground level (bgl) where a concrete obstruction was encountered that terminated the pits. TP28 recorded a thin layer of topsoil (0.16 m) underlain by another thin layer of sand and gravel (0.4 m) underlain by a firm to stiff clay to 4 m bgl. Groundwater was not encountered.

Faults

According to Groundsure there are no faults with the study area.

Natural Ground subsidence

According to Groundsure the potential for natural ground subsidence due to shrinking or swelling clays, compressible deposits, running sands, collapsible deposits, ground dissolution and landslides within the study area is negligible to very low.

Mining & Mineral safeguarding

According to the Groundsure report the study area is located in an area of known historical coal mining. e3p obtained a Coal Authority Mining Report in 2017 which identified that the site could be affected by underground mining in three coal seams identified present between 360 m and 1090 m depth, and last worked in 1961. The report states that there are no known mine entries on or within 20 m of the site. The report indicates that no notices have been issued stating that the land is at risk of subsidence and "any movement in the ground due to coal mining activity should have stopped". There are no plans to grant future licences.

The Greater Manchester Joint Minerals Plan[22] does not record any mineral sites (brick clay, aggregates, building stone, or coal) within the study area.

[21] Greater Manchester RIGS* Group (2023) Sites Map – Greater Manchester RIGS* Group (gmrigs.org.uk) [Accessed on the 14 March 2024]

[22] Greater Manchester Joint Minerals Plan April 2013. https://www.manchester.gov.uk/downloads/download/5550/greater_manchester_joint_minerals_development_plan_documents

Hydrogeology

According to the Groundsure report the superficial Devensian Till deposits are designated as a Secondary Undifferentiated aquifer by the Environment Agency (EA). The EA defines Secondary Undifferentiated aquifers as “where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type”.

The Chester Sandstone Formation bedrock is designated as a Principal aquifer. The EA defines Principal aquifers as “Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale”.

The Groundsure report does not record any licensed potable groundwater abstractions within the study area. The study area is not located within a groundwater Source Protection Zone (SPZ).

11.6.4 Contamination and Pollution Incidents

The Groundsure report records three pollution incidents within the study area, as summarised in Table 11-8 below.

Table 11-8 - Summary of Pollution Incidents

Location	Details	
107 m northwest	Incident Date: 22/05/2001 Incident Identification: 6328 Pollutant: Contaminated Water Pollutant Description: Other Contaminated Water	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
113 m northwest	Incident Date: 17/05/2001 Incident Identification: 5825 Pollutant: Contaminated Water Pollutant Description: Other Contaminated Water	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
204 m southwest	Incident Date: 22/02/2003 Incident Identification: 138638 Pollutant: Other Pollutant Pollutant Description: Other	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

11.6.5 Landfill and waste facilities

The Groundsure Report indicates that there no historical or current registered landfill sites located within the study area.

11.6.6 Unexploded Ordnance (UXO)

A review of the online unexploded bomb risk maps provided by Zetica[23] indicates that the study area is in a moderate risk area for encountering UXO related to World War II (WWII) bombs. A moderate risk is described by Zetica as areas indicated as having a bombing density of 15 to 49 bombs per 1,000 acres.

11.6.7 Radon

Information from the Groundsure report indicates that the study area is within" a low probability radon area, as "less than 1% of the homes are above the action level."

11.6.8 Sensitive Land Uses (for contamination receptors)

There are no environmental designations such as SSSIs, SPAs, SACs, ancient woodlands, nature reserves within the study area. The study area is located within the SSSI Impact Risk Zone (IRZ) for Rochdale Canal SSSI located at approximately 4.65 km northeast of the Site and the Site is classed as an open mosaic habitat which are described *as "brownfield sites that are identified under the UK Biodiversity Action Plan (UK BAP) as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates."*

There are no statutory Listed Buildings within the Site, however there are 202 Listed Buildings within 1 km of the Site, the closest being Grade II listed 32 and 34 Laystall Street located 124 m southwest from the Site.

11.6.9 Previous Ground Investigations

e3p 2017

In 2017, a pre-demolition (GI) was completed by e3p comprising a combination of window sample, cable percussive and rotary boreholes, seven of which were located within the Site.

Made Ground, generally between 0.25 m and 5.1 m thick, was recorded on site as a variable gravelly sand and sandy gravel with materials including clinker, brick, ash, limestone, mudstone, slate, timber, and rare porcelain. No visual or olfactory evidence of hydrocarbon impacted soil or groundwater was observed.

Superficial Deposits were recorded to be stiff gravelly and sandy gravelly Clay with local horizons of more silty Clay. Within the deeper boreholes the superficial deposits were proven to a maximum depth of 28 m bgl. Bedrock deposits comprised upper weathered horizons of Sandstone, becoming rock at depths of between 28.5 m and 39 m bgl on Site.

Groundwater monitoring and modelling completed by e3p indicated shallow groundwater at a depth of 2.91 m bgl.

On completion of the Site works, e3p undertook a contaminated land generic quantitative risk assessment (GQRA) for the Site using the data collected. e3p concluded that significant site wide contamination and unacceptable risks to human health or controlled wates had not been identified. Evidence of potentially volatile or soluble hydrocarbons was not noted present by e3P and the ground gas monitoring indicated no gas protection measures would be required in the redevelopment.

11.6.10 Sources of contamination

Through a review of available historical and published information (e.g. geological, hydrogeological and hydrological information), potential sources of contamination and associated contaminants were identified and/or discounted. Those sources/contaminants that are not discounted were then considered in relation to potential receptors that may be harmed by the source, and potential pathways that may link the sources to the receptors, i.e. source-pathway-receptor relationship.

A number of historical and current land uses have been identified on the Site and within 250 m of the Site which may have given rise to contamination.

On-Site

- Potential unidentified contamination from the historical land uses on site including iron works, tin works, timber shed, saw mill, and former retail park.

Off-Site

- Disturbed ground, Made Ground and worked ground where present adjacent to the Site;
- Historical discharges to groundwater;

[23] Zetica (2023) https://zeticauxo.com/downloads-and-resources/risk-maps/ [Accessed on 22 January 2024

- Historical industrial land uses including Mills (cotton, cloth and flour), timber yards, saw mill, coal yard, coal / Spindle wharfs, smithy, spindle works, hydraulic power station, tin works, dye works, glass works, engineering works, machine tools works, galvanizing works, waterproof works, electricity sub station, brass and iron works / foundries, paint works, soap works, and scrap metal yard.

11.6.11 Receptors

The following receptors have been identified at the Site based on the current end-use.

- Human Health:
  - On-Site pedestrians / trespassers, site visitors; and
  - Off-Site: neighbouring residents, members of public, and neighbouring commercial property users/workers.
- Groundwater:
  - Superficial Aquifers - Secondary Undifferentiated; and
  - Bedrock Aquifers – Principal Aquifer on and off-site and Secondary B aquifer off-site.

11.6.12 Pathways

Considering the identified receptors, a number of pathways are considered plausible based on the information gathered to date.

- Human Health:
  - Direct contact / ingestion of contaminants within Made Ground / soils or groundwater;
  - Inhalation of organic vapours from Made Ground / soils, soil derived dust, and groundwater;
  - Inhalation of dust and fibres from Made Ground / soils, soil derived dust;
  - Inhalation of ground gas;
  - Inhalation of asbestos fibres;
  - Direct contact / ingestion of contaminants within soils derived dust or groundwater migrating off-site;
  - Inhalation of organic vapours and asbestos fibres migrating off-site;
  - Inhalation of ground gases migrating off-site.
- Controlled Waters:
  - Leaching/dissolution from contaminated soils, followed by vertical migration;
  - Lateral migration of contaminants in groundwater;
  - Surface water run-off of mobile contaminants;
  - Migration via preferential pathways e.g. existing drainage.

Table 11-9 - Initial Conceptual Site Model – Existing conditions

Source *Potential Contaminants*	Receptor	Pathway	Consequence	Probability / Likelihood	Risk Category	Comments
On-site Unidentified contamination from historical industrial land uses on-site	**Human Health** **On-site:** Pedestrians / trespassers Site visitors	Direct contact / ingestion of contaminants within Made Ground / soils or groundwater	Minor	Unlikely	Very low	The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street, breaking the pathway in which contact would be made with contamination whether that be direct contact or inhalation. Where there are areas of vegetation, exposed soil may be present. Made Ground was recorded across the Site. No exceedances of the human health screening criteria for a commercial land use were recorded during the e3p ground investigation.
		Inhalation of organic vapours from Made Ground / soils, soil derived dust, and groundwater	Minor	Unlikely	Very low	
		Inhalation of dust and fibres from Made Ground / soils, soil derived dust	Minor	Unlikely	Very low	
		Inhalation of ground gas	Minor	Unlikely	Very low	Ground investigations undertaken by e3p indicate a CS1. The degradation of contaminants in the Made Ground within the Site may result in ground gas production. As there are no structures currently present on-site, gases are likely to dissipate into the atmosphere.
		Inhalation of asbestos fibres	Severe	Unlikely	Moderate / Low	No asbestos was identified during the during the e3p ground investigation. Based on the historical land uses of the Site and as Made Ground is present, the potential presence of asbestos cannot be completely dismissed.
	Human Health **Off-site:** Members of the public, neighbouring residents and commercial workers	Direct contact / ingestion of contaminants within soils derived dust or groundwater migrating off-site	Minor	Unlikely	Very low	The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street., it is unlikely large quantities of contamination in dust and fibres will migrate off-site.
		Inhalation of organic vapours and asbestos fibres migrating off-site	Minor	Unlikely	Very low	
		Inhalation of ground gases migrating off-site	Minor	Unlikely	Very low	The degradation of materials in the Made Ground may produce ground gas. As there are no structures currently present on-site, any gases generated are likely to dissipate to the atmosphere.
	Groundwater **On-site**: Superficial Secondary Undifferentiated Aquifer Bedrock Principal Aquifer **Off-site:** Superficial Secondary Undifferentiated Aquifer Bedrock Principal and Secondary B Aquifer	Leaching/dissolution from contaminated soils, followed by vertical migration Lateral migration of contaminants in groundwater. Migration via preferential pathways e.g. existing drainage.	Mild	Low	Low	The superficial deposits are identified as a secondary undifferentiated aquifer due to the variability of the rock. The bedrock deposits are identified as a Principal aquifer which indicates the strata has the potential to provide significant quantities of drinking water. As Made Ground is present across, there is potential for leaching of contaminants into groundwater. No exceedances in groundwater samples taken by e3p from the Made Ground groundwater and screened against DWSs.
Off-site Disturbed ground, Made Ground and worked ground adjacent to the Site Historical discharges to groundwater and surface water Historical industrial land uses adjacent to the Site.	**Human Health** **On-site:** Pedestrians / trespassers Site visitors	Ingestion and inhalation of contaminants within Made Ground / soils, soil derived dust, vapours, fibres or groundwater migrating onto Site	Minor	Low	Very low	Although the probability is low, there are a number of historical and current developments adjacent to the Site where contamination may have migrated from.
		Inhalation ground gas migrating onto Site	Minor	Unlikely	Very low	Potential for migration of gases to migrate onto Site. However, ass no enclosed spaces are present on-site, gases are likely to dissipate freely into the atmosphere.
	Groundwater **On-site:** Superficial Secondary Undifferentiated Aquifer Bedrock Principal Aquifer	Leaching/dissolution from contaminated soils, followed by migration Lateral migration of contaminants in groundwater. Migration via preferential pathways e.g. existing drainage.	Mild	Low	Low	The potential for contamination off-site to migrate to the Site in the underlying aquifers and impact groundwater on-site is low given the limited exceedances recorded in the groundwater beneath the Site.

11.7 Potential impacts

The baseline has indicated that the potential for natural ground subsidence due to shrinking or swelling clays, compressible deposits, running sands, collapsible deposits, ground dissolution and landslides within the study area is negligible to very low. In addition, there are no faults within the study area and the ground conditions indicate limited Made Ground up to 5.1 m thick underlain by firm to stiff clay. Mining is present beneath the Site at depths greater than 360 m, but the Coal Authority Report indicates that any movement should have stopped and that the risk of subsidence is low. Therefore, changes in topography, ground stability, and soil compaction have not been considered further in the assessment.

Effects on geology as a valuable resource have not been considered further in the assessment considering the absence of a safeguarded mineral resource or sensitive environmental designations such as geological SSSIs, Local Geological Sites (LGS) / RIGS.

The effects on soil as a valuable resource have not been considered further in the assessment as the Site is urban and soils have already been removed by previous development.

The effects to surface water are considered and assessed in Volume 2, Chapter 17 – Water Resources and Flood Risk and therefore have not been considered further within this assessment.

A summary of the potential impacts associated with ground conditions and contamination during construction and operation is presented below.

11.7.1 Construction phase impacts

Physical Effects: Soil erosion

Within the dog leg of the Site, parallel to Great Ancoats Street, and within Cotton Field Park, there is likely to be increased temporary soil erosion from vegetation clearance, general earthworks, temporary stockpiling, construction of new infrastructure and the movement of heavy plant.

Land contamination

The effects associated with land contamination have been assessed by comparing the baseline land contamination risks to those predicted during construction, while considering any new sources and pollution pathways introduced by construction activities. The construction phase CSM and risk assessments are included in Volume 3, Appendix 11.1.

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

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

Waste soils and soil re-use

Waste soils may be generated during construction through excavation works, installation of services, and vegetation planting. There is the potential that waste soil generated during construction would be classified as unsuitable for re-use on-site or hazardous, therefore requiring removal from Site.

Waste soils / arisings generated during earthworks for the adjacent Phase 1 development are proposed to be utilised for the levelling of site parkland. Potential waste soils were screened for commercial end use, and had no exceedances of relevant human health criteria and are assumed to be suitable for use.

11.7.2 Operation

Operational maintenance activities

Operational maintenance activities will likely be infrequent and minor in nature. These will include waste removals and general landscaping maintenance. This will likely require the use of vehicles for the movement of the waste and the transportation of maintenance workers to and from the Proposed Development, which therefore has the potential to introduce contaminants and pollution to the Site.

11.8 Assessment of effects

Table 11-10 Construction phase impact assessment

Receptor	Sensitivity	Impact	Mitigation	Residual impact magnitude	Residual effect	Effect significance
Construction workers	Low	Earthworks resulting in mobilisation of contaminants	Best practice pollution prevention measures	Negligible	Construction activities, such as earthworks, may expose the soil therefore increasing the risk of direct contact/ingestion of contaminants, inhalation of vapours and dust. The impacts on land contamination are considered to be permanent and direct. With the proposed mitigation measures adopted, the risks identified to human receptors during construction are assessed as very low to moderate/low. Compared to the existing baseline, the level of risk to receptors has generally remained the same during the construction phase. Potential effects associated with land contamination during construction have therefore been assessed as negligible which are classed as not significant.	Neutral or slight adverse effect Not significant
Human Health receptors within 250 m of the Site	Negligible	Earthworks resulting in mobilisation of contaminants	Best practice pollution prevention measures	Negligible	Construction activities, such as earthworks, may expose the soil therefore increasing the risk of direct contact/ingestion of contaminants, inhalation of vapours and dust. The impacts on land contamination are considered to be permanent and direct. With the proposed mitigation measures adopted, the risks identified to human receptors during construction are assessed as very low to moderate/low. Compared to the existing baseline, the level of risk to receptors has generally remained the same during the construction phase. Potential effects associated with land contamination during construction have therefore been assessed as negligible which are classed as not significant.	Neutral adverse effect Not significant
Groundwater	Low	Accidental spillage and release of hydrocarbons and oils from construction vehicles, plant, and equipment	Best practice pollution prevention measures	Negligible	Groundwater is at risk from the mobilisation of new contamination sources associated with construction activities such as accidental leaks and spills and turbid surface water runoff. Earthworks could create new pathways for contamination to reach groundwater sources. This could result in a reduction in the groundwater quality. The impacts on land contamination are considered to be permanent and direct. With the proposed mitigation measures adopted, the risks identified to controlled waters receptors during construction are assessed as very low to moderate/low. Compared to the existing baseline, the level of risk to receptors has generally remained the same during the construction phase. Potential effects associated with land contamination during construction have therefore been assessed as negligible which are classed as not significant.	Neutral or slight adverse effect Not significant

Table 11-11 Operational phase impact assessment

Receptor	Sensitivity	Impact	Mitigation	Residual impact magnitude	Residual effect	Effect significance
Users of the Proposed Development	Medium	Operational maintenance activities	None required	Negligible	Maintenance activities may expose the soil therefore increasing the risk of direct contact/ingestion of contaminants, inhalation of vapours and dust. Maintenance work is likely to be short term and infrequent. Works will be risk assessed, with method statements developed and best practice controls would be used to minimise potential exposure. The impacts on land contamination during the operational phase are considered to be permanent, short-term and direct. With the implementation of embedded mitigation, risks identified to human receptors during operation are assessed as very low to moderate / low. Compared to the existing baseline, the level of risk to receptors has generally remained the same. An overall negligible to minor beneficial effect is therefore concluded which is classed as not significant.	Neutral or slight adverse effect Not significant

Receptor	Sensitivity	Impact	Mitigation	Residual impact magnitude	Residual effect	Effect significance
Human Health receptors within 250 m of the Site	Negligible	Operational maintenance activities	None required	Negligible	Maintenance activities may expose the soil therefore increasing the risk of direct contact/ingestion of contaminants, inhalation of vapours and dust. Maintenance work is also likely to be short term and infrequent. Works will be risk assessed, with method statements developed and best practice controls would be used to minimise potential exposure. The impacts on land contamination during the operational phase are considered to be permanent, short-term and direct. With the implementation of embedded mitigation, risks identified to human receptors during operation are assessed as very low to moderate / low. Compared to the existing baseline, the level of risk to receptors has generally remained the same. An overall negligible to minor beneficial effect is therefore concluded which is classed as not significant.	Neutral adverse effect Not significant
Groundwater	Low	Operational maintenance activities	None required	Negligible	Groundwater is at risk from the mobilisation of new contamination sources associated with maintenance activities such as accidental leaks and spills and turbid surface water runoff. Earthworks could create new pathways for contamination to reach groundwater sources. This could result in a reduction in the groundwater quality. Maintenance work is also likely to be short term and infrequent. Works will be risk assessed, with method statements developed and best practice controls would be used to minimise potential exposure. The impacts on land contamination during the operational phase are considered to be permanent, short-term and direct. With the implementation of embedded mitigation, risks identified to controlled waters receptors during operation are assessed as very low to moderate / low. Compared to the existing baseline, the level of risk to receptors has generally remained the same. An overall negligible to minor beneficial effect is therefore concluded which is classed as not significant.	Neutral or slight adverse effect Not significant

11.9 Additional mitigation and enhancement measures

11.9.1 Production of RAMS and adoption of appropriate PPE and best working practices

Health and safety Risk Assessment and Methods Statements (RAMS) will be undertaken for all construction activities which will be developed and managed by the Principal Contractor through the Detailed CMP. Best practice measures include:

- Development of health and safety risk assessments, method statements and use of appropriate Personal Protective Equipment (PPE) for the protection of construction workers in accordance with the COSHH Regulations;
- Implementation of appropriate dust suppression measures to prevent migration of contaminated dust and fibres as appropriate;
- Working methods during construction to manage groundwater and surface water appropriately and ensure that there is no run-off from the works, any material / waste stockpiles, and storage containers into adjacent surface watercourses in accordance with Environment Agency guidance;
- Stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) and timely removal of stockpiled soil to prevent generation of windblown dust and surface water run-off;
- Clear segregation between stockpiled material including imported material, excavated material stockpiled for re-use and excavated waste material stockpiled for treatment and / or off-site disposal;
- Limiting the area of earthworks at any one time to reduce temporary effects on soil erosion;
- Appropriate management of materials during the works in accordance with relevant regulations and best practise methods;
- Where waste soil is generated, it will be dealt with in line with the Government's waste hierarchy which is a guide to sustainable waste and material resource management;
- Implementation of appropriate pollution incident control e.g. plant drip trays and spill kits; and
- Implementing appropriate and safe storage of fuel, oils and equipment during construction in accordance with COSHH regulations.

11.9.2 Best practice pollution prevention measures

Potential impacts from construction can be mitigated through best practice measures which are associated with good site practice and preparation of robust method statements. Mitigation measures which will be implemented to mitigate any potential impacts to the water environment during construction of the Scheme will include adhering to Guidance such as Guidance on Pollution Prevention (GPPs) and CIRIA C715 Environmental good practice. Although now withdrawn by the Environment Agency, their Pollution Prevention Guidelines still detail good practice advice for undertaking works which may have the potential to result in water pollution. In general terms, by following these guidelines, significant impacts to the water environment will be avoided.

11.10 Cumulative effects

This planning application has sight of the prospective Phase 2 development adjacent to the east of the Proposed Development as disclosed within the SRF 2023. It is understood that this will comprise a commercial development with opportunities for ancillary ground floors to provide active frontages. The buildings will be of heights between 6-16 storeys and vehicular access will be available via Old Mill Street. It is assumed the Proposed Development will have been constructed prior to the construction of the Phase 2 development and therefore no cumulative effects are anticipated during the construction phases as these will not overlap. In relation to the operational phase, no significant effects are anticipated by the ground conditions and contamination assessment for the Proposed Development and therefore it is assumed there will be no operational effects so large as to influence the cumulative effects in combination with the Phase 2 development. Therefore, the Proposed Development is not expected to result in adverse cumulative effects in combination with those of the Phase 2 development during its construction nor its operation.

There are no other anticipated future developments to consider within this assessment of inter-cumulative effects as all applications within the planning portal as the time of assessment are expected to already be constructed prior to the Proposed Development. However, it is advised that should concurrent construction projects occur that regular liaison is carried out between the environment manager/engineer or the site manager ensure mitigation measures remain appropriate.

Intra-cumulative effects of the Proposed Development are considered in Volume 2, Chapter 20 of this ES.

11.11 Summary and conclusions

Environmental impacts are likely to be greatest during constriction, with reduced impacts likely during operation. Negligible to minor effects have been identified on soil erosion, land contamination, soils re-use and waste soils through the assessment process. These are classed as not significant.

The environmental assessment presented in this chapter has therefore concluded that, throughout the construction and operational phases, there will be no significant effects on ground conditions and contamination.

Following assessment, no additional mitigation is considered necessary. Enhancement measures may be available during the detailed design associated with soils reuse and materials management. Residual effects during construction or operation are not anticipated.

11.12 Glossary and acronyms

Table 11-12 – Glossary and acronyms

Term	Definition
BGS	British Geological Survey
BS	British Standard
CDM	Construction (Design and Management)
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
COSHH	Control of Substances Hazardous to Health
CSM	Conceptual Site Model
DoE	Department of the Environment
DoWCoP	Definition of Waste Code of Practice
DWS	Drinking Water Standard
EA	Environment Agency
EIA	Environmental Impact Assessment

Term	Definition
EPA	Environmental Protection Act
EQS	Environmental Quality Standard
ES	Environmental Statement
GAC	Generic Assessment Criteria
GI	Ground Investigation
GQRA	Generic Quantitative Risk Assessment
LCRM	Land Contamination Risk Management
LGS	Local Geological Sites
m bgl	metres below ground level
MMP	Materials Management Plan
NPPF	National Planning Policy Framework
PCL	Potential Contamination Linkage
PCSM	Preliminary Conceptual Site Model
PPE	Personal Protective Equipment
PPG	Planning Practice Guidance
RIGS	Regionally Important Geological Sites
SAC	Special Areas of Conservation
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compound
SWMP	Site Waste Management Plan
TPH	Total Petroleum Hydrocarbons
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WFD	Water Framework Directive

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