Intended for
Manor Farm Propco Limited

Document type
Report

Date
December 2024

Project Number
16200016166-006

Generic Quantitative Risk Assessment

Manor Farm, Poyle, Slough, UK

Bright ideas.
Sustainable change.

Generic Quantitative Risk Assessment

Manor Farm, Poyle, Slough, UK

Project name	**Manor Farm, Poyle, Slough, UK**
Project no.	**REH2023N02678-RAM-RP-00012_V2.docx**
Recipient	**Manor Farm Propco Limited**
Document type	**Report**
Version	**2.0**
Date	**12/12/2024**
Prepared by	**Ellie Brown**
Checked by	**Jon Eudall**
Approved by	**Jon Eudall**
Description	**Generic Quantitative Risk Assessment**

Ramboll UK Limited
Registered in England & Wales
Company No: 03659970
Registered office:
240 Blackfriars Road
London
SE1 8NW

Contents

Executive Summary		i
1.	Introduction	1
1.1	Brief	1
1.2	Objectives	1
1.3	Sustainability	1
1.4	Constraints and Limitations	2
2.	Summary of Previous Risk Assessments	3
2.1	Site Layout	3
2.2	Previous Fugro Site Investigation Summary	3
2.3	2021 Ramboll Investigation Summary	4
2.4	2023 Ramboll Monitoring Summary	4
2.5	2024 Ramboll Monitoring Summary	4
2.6	Preliminary Conceptual Site Model	4
3.	2019 and 2021 Site Investigations	8
4.	Groundwater Monitoring and Sampling	10
4.1	Ramboll 2021 Monitoring	10
4.2	Ramboll 2023 Monitoring	10
4.3	Ramboll 2024 Monitoring	11
4.4	Field Observations	11
5.	Human Health Assessment	14
5.1	Assessment Approach	14
5.2	Analytical Results - Soils	14
5.3	Asbestos	15
5.4	Human Health Discussion	16
5.5	Construction Workers	16
5.6	Analytical Results - Groundwater (Human Health)	17
6.	Water Environment Assessment	18
6.1	Assessment Approach	18
6.2	Analytical Results	18
6.3	Controlled Waters Discussion	22
7.	Ground Gas Assessment	27
7.1	Assessment Approach	27
7.2	Ground Gas Monitoring Results	27
7.3	Results and Discussion	27
7.4	Classification of Ground Gases	28
8.	Source-Pathway-Receptor Risk Assessment	31
8.1	Updated Conceptual Site Model	31
8.2	Climate Change Considerations	33
9.	Conclusions and Recommendations	34
9.1	Conclusions	34
9.2	Sustainability	35
9.3	Recommendations	35

Appendices

Appendix 1
Figure 1: Site Location Plan
Figure 2: Site Layout Plan

Figure 3: Borehole Location Plan
Figure 4: Surface Water Sampling Location Plan
Figure 5: Historic Landfill Extent Plan
Figure 6: Groundwater Contour Plot December 2019
Figure 7: Groundwater Contour Plot August 2019
Figure 8: Groundwater Contour Plot February 2024
Figure 9: Groundwater Contour Plot July 2024
Figure 10: Site Cross Section

Appendix 2
Legislative Context and Methodology

Appendix 3
Factual Site Investigation Information

Appendix 4
Field Methods

Appendix 5
Laboratory Testing Results – Summary Tables

Appendix 6
Laboratory Certificates

Appendix 7
Monitoring Results

Appendix 8
Annual Monitoring Report

Executive Summary

Ramboll UK Limited (Ramboll) has been instructed by Manor Farm Propco Limited to prepare a Generic Quantitative Risk Assessment for an area of land at Manor Farm, Poyle, Slough, SL3 0BL (the “Site”) in association with the proposed redevelopment of the site as a datacentre and a battery energy storage system (BESS). A Site Location Plan is provided in Figure 1.

This report includes the objectives and reasons for undertaking a Generic Quantitative Risk Assessment, provides a summary of relevant background information, details previous intrusive ground investigations, ongoing groundwater and surface water sampling and subsequent findings, specifies how relevant generic assessment criteria were selected, provides a risk assessment and conceptual site model and identifies data gaps and further actions which are required.

Potential contaminant linkages (PCLs) were identified at Preliminary Risk Assessment (PRA) stage through development of a preliminary conceptual site model (CSM). Those PCLs assessed relate to the site’s historic use as a landfill (comprising the south and north-west of the site) and historic former and contemporary light industrial/ commercial land uses and relatively sensitive groundwater, surface water and current and future human health receptors present.

Results of chemical soil testing identified the presence of localised ground contamination in the north-west of the site. Asbestos was also recorded in 13 locations on and in the immediate vicinity of the site at concentrations that range from <0.001% to 0.967% and that exceed the hazardous waste thresholds in a number of samples (relevant only for soil disposal aspects). Risks to construction workers are considered to be mitigated through the provision of appropriate PPE and good environmental site practices. In addition, the proposed design will result in a significant proportion of the site comprising concrete hardstanding or building footprint resulting in the site being ‘capped’, preventing any interaction between future site users with asbestos containing soils. It is understood that stripping of surface soils is likely as part of the demolition and construction phases at the site. Further consideration of asbestos risks is captured in the outline remediation strategy that accompanies this report.

No exceedances of screening of groundwater samples against the GAC for a commercial/ industrial development were encountered, indicating that a feasible groundwater volatilisation source is not present beneath the site.

The presence of residual and elevated concentrations of contaminants including ammoniacal nitrogen, iron and petroleum hydrocarbons in groundwater is considered to be typical of a site subject to variable filling and whilst there is contamination present, there is considered to be limited potential for this to represent a significant risk to wider groundwater or surface waters. Petroleum hydrocarbon contamination identified in the north of the site is also considered to be associated with the presence of the now decommissioned diesel USTs; however, it is understood that below ground fuel infrastructure will be removed as part of the development.

Whilst exceedances of inorganic and organic contaminants were recorded in excess of relevant GAC or EQS protective of the surface water and groundwater environments, the presence of low permeability clayey Made Ground deposits and reworked Alluvium along the site boundaries is expected to act as a mitigating factor to off-site contaminant migration. Likewise, deposits of low permeability Alluvium along the east of the site are expected to limit lateral migration that could potentially impact the off-site superficial aquifer. The deeper chalk Principal Aquifer is considered to be protected from the vertical migration of impacted groundwater due to the presence of the underlying impermeable London Clay bedrock.

The difference in elevation between groundwater beneath the site and surface water levels within the nearby Poyle Channel indicates that the two waterbodies are not in significant hydraulic continuity. In addition, no correspondingly increased concentrations of contaminants have been recorded in surface water samples taken from the Poyle Channel or Colne Brook. This indicates that contaminated groundwater beneath the site is not interacting with nearby surface waters, and therefore no potential risk has been identified. Based on HAL's ground gas monitoring from 2019 the ground gas regime beneath the site corresponds with Characteristic Situation 4; however, Ramboll's most recent monitoring data from September 2023 to October 2024 recorded concentrations and flow rates consistent with a Characteristic Situation 3 classification, which is typical of old landfill sites. As such Ramboll considers that a CS4 classification for the site is not representative. It would be prudent to undertake further investigation of the gas source beneath the datacentre building and to use to continuous monitoring techniques to further assess using quantitative techniques the characteristic situation during the detailed design stage.

The identified contamination is considered to be manageable in the context of the proposals of a low sensitivity commercial use. Furthermore, the proposals will improve the existing site conditions and remove obvious sources of contamination (e.g. the underground storage tanks) during the works. The site is considered suitable for commercial development subject to the further recommendations set out below. The following steps are recommended by Ramboll:

- Further investigation is recommended to delineate areas of potential contamination and provide ground and groundwater information in areas of data gaps to support a robust remediation design.
- On-going groundwater monitoring is recommended prior to, throughout and following the construction phase.
- Ground gas protection measures in line with requirements of CS3 should be included in the design of all buildings on site (including smaller buildings associated with the BESS). Continuous monitoring and detailed risk assessment is recommended to refine the gas protection measures.
- As standard for a redevelopment a 'remedial strategy' should be prepared that outlines good environmental practices and precautions that should be followed during redevelopment works.
- In accordance with good practice in developing brownfield land, it is recommended that a watching brief is implemented during ground works to identify unforeseen ground conditions or localised contamination hotspots (e.g. concentrated pockets of asbestos or hydrocarbons), especially during the removal of the decommissioned fuel tank and associated infrastructure (e.g. pipework). If previously unforeseen contamination is identified, the risk assessment should be updated accordingly.
- Material re-use aspects are considered in more detail in the outline remediation strategy.
- Surface water features such as swales as part of the development should be designed/lined to prevent interaction with any potentially impacted underlying groundwater.

1. Introduction

1.1 Brief

Ramboll UK Limited (Ramboll) has been instructed by Manor Farm Propco Limited to prepare a Generic Quantitative Risk Assessment (GQRA) for an area of land located at Manor Farm, Poyle, Slough, SL3 0LB (the "site").

The GQRA has been undertaken in connection with the demolition of existing buildings and the redevelopment to comprise a Data Centre (Use Class B8) and Battery Energy Storage System (BESS) with ancillary substation, welfare and guard buildings, offices, associated plant, emergency backup generators and associated fuel storage, landscaping, sustainable drainage systems, car and cycle parking, and new and amended vehicular and emergency access from Poyle Road. A Site Location Plan is provided in Figure 1.

This GQRA is produced with consideration to Tier 2 of Stage 1 (Risk Assessment) of Land Contamination Risk Management (LCRM) published by the Environment Agency (EA) in 2021. As such, the brief is to present the objectives, the scope of investigation, define generic assessment criteria to which results of investigation can be compared, present investigation findings and assessment of results, and update the preliminary conceptual site model (CSM) for the site which was produced at the Preliminary Risk Assessment (PRA) stage. The conclusions of the report are intended to inform what further action may be needed to sustainability regenerate the site as brownfield land.

1.2 Objectives

The objectives of this report build upon the preliminary risk assessment and consider LCRM, specifically the objectives include:

- confirm which potential contaminant linkages identified at PRA stage are to be assessed;
- document findings of previous ground investigations, and interpret the environmental ground conditions encountered during ground investigations;
- establish appropriate generic assessment criteria and a standard set of generic assumptions to assess the risks;
- assess the potential for risks to both human health and environmental receptors (including controlled waters) based on the data collected;
- carry out a contaminated land risk assessment based on a source-pathway-receptor methodology;
- present a refined Conceptual Site Model based on the findings of the ground investigation;
- identify potential for changes to ground conditions due to weather conditions and seasonal/climatic patterns and how these changes may affect the CSM;
- provide a commentary on contaminated land risks; and
- assess what further action is needed.

1.3 Sustainability

The United Nations (UN) 2030 Agenda for Sustainable Development sets 17 Sustainable Development Goals (SDGs) which are designed to promote the achievement of a better and more sustainable future for all.

Contamination and pollution are recognised by the United Nations as risks to human health and wellbeing as well as sustainability of the places where we live. A target to substantially reduce those risks is enshrined in the UN Sustainable Development Goal (SDG) No 3: Good Health and Wellbeing, as well as SDG No. 11: Sustainable Cities and Communities, which also emphasises sustainable management of waste. Pollution is likewise recognised as a potential threat to water quality, both for human consumption and for its ability to support water-related ecosystems (UN SDG No. 6: Clean Water and Sanitation).

Contamination and pollution within soils, water and air at the site have been identified through the conceptual site model development process and strategic sampling and analysis. Characterisation and, if recommended as a result of the assessment contained within this report, remediation of contamination at the site thus directly support achievement of UN strategy. Implemented through technically robust investigation and risk assessment this focusses the proposals for remedial works where there is a scientifically justifiable need, thus minimising the carbon footprint of works carried out (supporting SDG No 13: Climate Action) as well as production of waste (SDG No. 11). In order to recognise where the GQRA works completed are of relevance to the progression of the UN's SDG objectives, reference is made in this report to relevant SDGs.

1.4 Constraints and Limitations

This report has been prepared by Ramboll exclusively for the intended use by the client in accordance with the agreement (proposal reference number REH2024N145697-RAM-SS-PO-0001_2.0), dated 13 August 2024, defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

In general terms, the regulatory status of certain contaminants is continuing to evolve, and the scientific community is generating additional data regarding substance properties and potential impact. The conclusions of this report are therefore based on the current understanding and reputable scientific information.

As part of this assessment Ramboll has used information from ground investigation and monitoring reports completed on behalf of Heathrow Airport Ltd (HAL) in 2019. Whilst, Ramboll has analysed this data it should be noted that Ramboll was not involved in the production of these reports and therefore cannot guarantee their quality.

Constraints encountered during both the HAL and Ramboll site investigations and groundwater monitoring/sampling rounds are reported in the relevant technical notes and ground investigation reports. Overall, Ramboll considers that a reasonable amount of the site has been investigated to identify potential contaminant sources.

2. Summary of Previous Risk Assessments

Details of the PRA for the site are provided in full in Ramboll report REH2024N02678-RAMP-RP-0002_P1_PRA. The section below provides a summary of the key findings and details the relevant potential contaminant linkages (PCLs) which were identified as needing further investigation and quantification. Significant PCLs are those which were assessed in the PRA to be at low-moderate risk or of higher risk.

For a complete summary of the site's location, history and environmental setting the descriptions are provided in the PRA. The below presents a summary of the site layout and the previous investigations, which have been undertaken at the site.

2.1 Site Layout

The site comprises two main areas, which are connected by a strip of land that runs from north to south.

The northern section consists of two large areas used for airport car parking with the central and western areas comprising a mix of light industrial and commercial units. A residential building is situated in the east of the site adjacent to the access road leading from Poyle Road. Part of this area was formerly a builder's yard, in which there are two underground diesel storage tanks (USTs). This area is intended to be developed as a datacentre.

The central area of the site comprises a narrow strip of land running from north to south. Thames Wire Metalworks, a metal fabricator warehouse with smaller ancillary buildings and areas of car parking and materials storage is located in the north of this strip. This area is intended to be developed as a datacentre strip. This corridor provides access between the two main development areas.

The southern parcel comprises approximately 25% of the site and consists of vacant former agricultural land and some derelict metal sheds with a footpath running from west to east along its northern extent. This area is intended to be developed as a Battery Energy Storage System (BESS).

The south and a marginal area in the north-west of the site has historically been subject to widespread gravel extraction and then used as a landfill (1948-1980, licensed from 1974). The majority of the northern portion of the site appears to comprise more re-worked natural deposits and construction wastes and this aligns to the regulatory records of the extent of the landfill. Infilled ground in the south of the site typically contained a mixture of construction wastes as well as plastic, timber and bagged plastic waste. There is no record or evidence of the landfill being provided with engineered controls such as a landfill cap, walls or basal layer and so effectively acts as a 'dilute and disperse' landfill. The landfill extended off to the west and a separate landfill was present to the immediate north of a similar age.

2.2 Previous Fugro Site Investigation Summary

In 2019 Fugro undertook a geotechnical investigation of the site, which included the drilling of ten boreholes within the site boundary (BH2514, BH2515, BH12516, BH2518, BH2519, BH2520, BH2521, BH2523, BH2526 and BH2527) and five off-site locations in close proximity within the wider landfill area (BH2513, BH2517, BH2522, BH2524 and BH2525) and undertook ten rounds of ground gas monitoring.

Fugro encountered Made Ground to between 3.50m to 6.20m below ground level (bgl), underlain by either River Terrace Deposits or London Clay. Only one borehole (BH2515) in the site boundary recorded evidence of landfill material in the deeper Made Ground, from 2.50m to 5.20m bgl in the north-west of the site (BH2514), although this largely comprised inert material. The majority of the Made Ground appeared to consist of largely inert type materials apart from some occasional wood debris. Groundwater was present at depths of approximately 1.0–3.0m bgl within the Made Ground. It should be noted that the north-east of the site appears to have been subject to less excavation than the west/south of the site and off-site areas further west, hence this appears to be why there is landfill material present across the datacentre area.

2.3 2021 Ramboll Investigation Summary

In 2021 Ramboll undertook targeted works on-site that included drilling two boreholes and a single round of groundwater and ground gas monitoring and groundwater sampling. Two locations (WS02 and WS03) were drilled within the site boundary, in the south-west of the northern parcel of the site.

The majority of the area investigated comprised the off-site historical landfill with at least a 6m thickness of fill material in the centre of the site. Generally, boreholes drilled on the northern and western boundaries of the landfill identified 1.0 – 2.0m of reworked clay type Made Ground overlying the gravels, which suggests landfill material does not extend fully to the site boundary. No free phase oily or tarry residues, unusual chemical colours/odours; or items such as waste drums etc were encountered on-site or off-site.

2.4 2023 Ramboll Monitoring Summary

In 2023 Ramboll undertook ground gas monitoring and groundwater monitoring and sampling of nineteen boreholes (nine Ramboll boreholes and ten HAL boreholes). This included boreholes on-site and those on the wider landholding. Two surface water samples were taken from the Colne Brook, one upstream and one downstream of the site.

2.5 2024 Ramboll Monitoring Summary

To further inform the development activities in 2024 Ramboll has undertaken quarterly rounds of surface and groundwater monitoring and sampling across a select number of boreholes throughout 2024. These comprised quarterly sampling rounds of seven boreholes on-site (BH2513, BH2514, BH2516, BH2517, BH2518, BH2520 and BH2522) with an additional seven locations on-site (BH2526 and BH2527) and off-site (WS06, WS07, WS13, WS16 and WS18) monitored every six months. Three surface water samples were collected during each monitoring visit; these comprised two samples from the Colne Brook both upstream and downstream of the site, and one sample taken from upstream of the site in the Poyle Channel.

The Poyle channel flows in close proximity to the north of the site and Ramboll understands this watercourse to be artificial in nature and was created to support surface water flood relief efforts in this area historically rather than being a natural feature.

Details of Ramboll's 2024 monitoring results are presented in the Annual Monitoring Report in Appendix 8.

2.6 Preliminary Conceptual Site Model

The main environmental legislation relating to contaminated land in the UK is Part 2A of the Environmental Protection Act 1990. The philosophy behind Part 2A is the source-pathway-receptor potential contaminant linkage; for land to be contaminated all three aspects of this linkage must be present (i.e. a contaminant must be present and able to move along a pathway and impact a receptor). Further details are provided in Appendix 2.

A preliminary conceptual site model that identifies those potential contaminant linkages forms the output of the PRA and is a simplified representation of the environmental conditions at the site, and in the vicinity of the site, and is used to initially identify potentially sensitive receptors and potential pollutant linkages.

A key aspect of LCRM is that the GQRA should assess the potential contaminant linkages identified in the preliminary conceptual site model. Those PCLs which were identified in the PRA's CSM as being significant and thus warranting further investigation are presented in Table 2-1 below.

Table 2-1 Preliminary Conceptual Site Model

Source	Pathway	Potential Receptor	Potential Consequence	Probability Risk	Level of Risk
On-Site Sources					
Gravel extraction, processing and washing activities, infilled ground and landfilling (various contaminants associated with the presence and degradation of waste materials including organic and inorganic contaminants, including, but not limited to, ammoniacal nitrogen, dioxins and perfluorinated compounds) Former builders yard activities Presence of two former USTs (1940's to 1980's) (diesel) in the northern- portion of the site Electricity substation (oils and PCBs) in the northern- portion of the site	Leaching to Groundwater and Groundwater Flow	Off-site Principal Aquifer	Mild	Likely	**Low to moderate**
		Secondary A Aquifer/ Principal Aquifer (beneath the London Clay)	Mild	Unlikely	**Very Low**
		Surface watercourses (Poyle Channel)	Medium	Unlikely	**Low**
		Surface watercourses (Colne Brook)	Mild	Unlikely	**Very Low**
	Dermal Contact/ ingestion of soils/ dusts/ inhalation of dusts/ fibres	Current residential site users	Severe	Unlikely	**Low to moderate**
		Future site users	Severe	Low Likelihood	**Moderate**
		Construction Workers	Severe	Likely	***Low**
		Adjacent site users	Medium	Low Likelihood	**Low to moderate**
	Ground gas and vapour generation	Current residential site users	Severe	Unlikely	**Low to moderate**
		Future site users	Severe	Likely	**High**
		Adjacent site users	Medium	Low Likelihood	**Low to moderate**
		On-site buildings and structures	Severe	Likely	**High**
Off-Site Sources					
Industrial/Trading Estate to the east Landfills adjacent to the west and north and in the wider surrounds Potential contaminants include heavy metals, petroleum hydrocarbons, PAHs, VOCs, SVOCs,	Leaching and movement on to site via Groundwater Flow	On-site groundwater in Principal and Secondary Aquifers	Mild	Likely	**Low to moderate**
	Ground gas and vapours generated from landfill	Current residential site users	Medium	Low Likelihood	**Low to moderate**

Source	Pathway	Potential Receptor	Potential Consequence	Probability Risk	Level of Risk
PCBs, asbestos and elevation concentrations of ground gases		On-site buildings and structures	Medium	Low Likelihood	**Low to moderate**
		Future site users	Medium	Low Likelihood	**Low to moderate**

Notes:

Should the development proposals alter significantly a review of this risk assessment may be required.

*Given the use of appropriate PPE and on-site health and safety precautions, risk to construction workers would be reduced to low.

3. 2019 and 2021 Site Investigations

3.1.1 Ground Conditions

A cross section showing the variation in ground conditions across the site is shown in Figure 10, Appendix 1 and a full lithological description is recorded on the logs, which are provided as Appendix 3.

In 2019 Fugro encountered Made Ground to between 3.50m to 6.20m below ground level (bgl), underlain by either River Terrace Deposits or London Clay on-site. Only one borehole (BH2515) recorded evidence of landfill material in the deeper Made Ground, from 2.50m to 5.30m bgl in the north-west of the site, although this largely comprised non-putrescible material (i.e. would not degrade to produce leachate or gas). The majority of the Made Ground appeared to consist of largely non-putrescible type materials apart from some occasional wood debris. Groundwater was present at depths of approximately 1.0–2.0m bgl within Made Ground. It should be noted that the north-east of the site appears to have been subject to less excavation than the off-site areas, hence why less landfill material may be present.

The 2021 Ramboll intrusive works comprised investigation across the wider off-site landfill area to the west of the site targeting previously un-investigated areas. The majority of the area investigated comprised the off-site historical landfill with at least a 6m thickness of fill material in the centre of the site. Generally, boreholes drilled on the northern and western boundaries of the landfill identified 1.0 – 2.0m of reworked clay type Made Ground overlying the gravels, which suggests landfill material does not extend fully to the site boundary. However, this does not appear to be an engineered barrier. No free phase oily or tarry residues, unusual chemical colours/odours; or items such as waste drums etc were encountered.

The ground conditions encountered across the site are generally comparable to the geology described in the British Geological Survey (BGS) map of the area.

Table 3-1 provides information of where notable visually or olfactory impacted soils were recorded, and any associated readings made using a photoionisation detector (PID) to correlate with the location of possible volatile substances.

Observations from exploratory locations within 50m of the site have been included to provide further context and to consider the off-site source potential of the landfill area to the west.

Table 3-1 Observations in Soils

Exploratory Location	Observations	PID Reading (parts per million (ppm))
Made Ground		
On-Site (Datacentre Development Area)		
BH2514	Landfill waste observed at 2.0–2.5m bgl; slight hydrocarbon and organic odour	<0.1
BH2515	Slight organic odour observed at 1.3–2.5m bgl Landfill waste observed at 2.5–5.3m bgl; slight organic odour	<0.1
BH2501	Slight organic odour observed at 0.9–2.1m bgl	-
BH2516	Slight organic odour observed at 0.5–3.0m bgl	<0.1
BH2492	Clinker observed in gravel at 0.0–0.7m bgl Rare fragments of clinker (<5x15mm) observed at 0.7–1.6m bgl Green discolouration observed at 1.6–3.0m bgl	-

Exploratory Location	Observations	PID Reading (parts per million (ppm))
BH2519	Rare fragments of clinker (<60mm) observed at 0.0–1.0m bgl Occasional fragments of clinker (<60mm) and clinker in gravel observed at 1.0–1.4m bgl Slight organic odour observed at 3.5–5.1m bgl	<0.1–0.3 0.2 <0.1–0.6
BH2506	Frequent subangular fragments of slag (<5x60mm) observed at 0.3m bgl Slight organic odour observed at 0.55–1.2m bgl	-
BH2520	Slight organic odour observed at 0.6–1.9m bgl Slight hydrocarbon odour observed at 1.9–2.7m bgl Slight organic odour observed at 2.7–6.2m bgl	<0.1–0.1 0.1–1.1 <0.1–1.1
BH2489	IDT engineer noted rare fragments of possible asbestos tile and glass at 0.0–1.7m bgl IDT engineer noted rare fragments of clinker at 1.7–1.9m bgl	-
BH2523	Possible asbestos tile (<5x5mm) observed at 0.0–1.8m bgl Rare fragments of clinker (<60mm) observed at 1.8–2.5m bgl	<0.1
Off-Site (within 50m)		
TP2558	Landfill waste observed at 0.2–3.5m bgl Landfill waste observed at 3.6–3.8m bgl; frequent purple-black oily staining	<0.1
BH2497	Possible ACM (<3x100x150mm) observed at 1.5–2m bgl Landfill waste, including a fragment of possible ACM tile, observed at 1.7m bgl and 1.9m bgl	<0.1
BH2522	Landfill waste observed at 0.8–1.0m bgl Fragment of possible ACM (<3x40x50mm) observed at 0.9–1.0m bgl Landfill waste observed at 2.4–4.2m bgl	<0.1
BH2486	Rare pockets of clinker (<10x10mm) observed at 1.4–1.8m bgl	-
BH2524	Occasional fragments of clinker (<60mm) observed at 0.1–1.3m bgl Occasional pockets of clinker (<10x10mm) observed at 1.3–1.9m bgl Rare fragments of clinker (<60mm) and a slight putrid odour observed at 1.9–4.0m bgl Occasional fragments of clinker (<60mm) observed at 4.0–4.9m bgl	<0.1–0.2 <0.1 <0.1–0.7 <0.1

4. Groundwater Monitoring and Sampling

Groundwater sampling locations are presented in Figure 3 and borehole logs (including monitoring well details) are provided in Appendix 3.

4.1 Ramboll 2021 Monitoring

One round of groundwater monitoring and sampling was undertaken in August 2021 as part of Ramboll's investigation of the wider landfill site. Two samples were collected from boreholes WS02 and WS03, which were located in the vicinity of the USTs in the former builder's yard. These wells were subsequently lost during the closure of the builder yard and only sampled on one occasion.

4.2 Ramboll 2023 Monitoring

The groundwater monitoring and sampling was undertaken between the 25th and 28th September 2023. Nineteen boreholes were sampled overall, including nine Ramboll locations and ten HAL wells (the deeper groundwater monitoring installations). Gas monitoring took place from the shallow HAL wells, see Table 4-1.

Table 4-1 HAL borehole installations monitored in September 2023

HAL Borehole Location	Deep Installation (Groundwater)	Shallow Installation (ground gas)
On-Site (Datacentre Development Area)		
BH2514	X	
BH2498		X
BH2518	X	
BH2499		X
BH2520	X	
BH2506		X
On-Site (Battery Energy Storage System)		
BH2526	X	
BH2488		X
BH2527	X	
BH2484		X
Off-Site (within 50m)		
BH2513	X	
BH2496		X
BH2517	X	
BH2495		X
BH2522	X	
BH2497		X
BH2524	X	
BH2486		X
BH2525	X	
BH2490		X

Of the seventeen Ramboll boreholes nine were sampled. Three monitoring wells were recorded as being dry to the base of the borehole and could not be sampled or visually inspected with a bailer; these included WS04, WS05 and WS20. An additional five locations contained volumes of water in the standpipes too low to sample. These were WS09, WS10, WS11, WS12 and WS14. Two surface water samples were also collected from the Colne Brook from locations up and downstream of the site; the Poyle channel was not sampled upstream of the site at this point. Surface water sampling locations are presented in Figure 4 (Appendix 1).

Prior to commencing groundwater sampling, resting groundwater levels were measured using a dip-meter. Each well sampled was developed of 'stagnant' water that would have been in contact with the well casing and atmospheric gases. This was carried out using a disposable bailer to purge three times the well volume. Following a period of rest (at least 24 hours), samples were collected from the selected monitoring wells using a bailer. The visual observations of the groundwater were recorded from a sample obtained from each monitoring well using a dedicated disposable bailer.

4.3 Ramboll 2024 Monitoring

Quarterly rounds of ground gas and groundwater monitoring were undertaken across a select number of boreholes throughout 2024. These comprised sampling of four on-site boreholes (BH2514, BH2516, BH2518 and BH2520) and three within the immediate vicinity of the development area (BH2513, BH2517 and BH2522) quarterly with an additional seven locations on and off-site (WS06, WS07, WS13, WS16 and WS18 from the wider landfill site to the west, and BH2526 and BH2527 in the south of the site) monitored every six months. The first monitoring round in February 2024 utilised bailers to purge and sample each borehole. From April 2024 onwards low flow techniques were used to sample each borehole, which can allow for purging of water whilst reducing the turbidity of the sample and allowing for on-site indicators as to water quality.

Three surface water samples were collected during each monitoring visit; these comprised two samples from the Colne Brook both upstream and downstream of the site, and one sample taken from upstream of the site in the Poyle Channel.

One duplicate groundwater sample was taken during each monitoring round between 2023 and 2024 for quality assurance purposes. The samples were placed in containers appropriate for the type of analysis, sealed and labelled, and stored in cool boxes under chilled conditions, prior to transportation to an accredited independent analytical laboratory (Element Materials Technology Ltd) with the relevant chain of custody documentation.

Monitoring of waters and ground gas was undertaken at selected locations across the site from perched groundwater within the landfill waste and Made Ground material.

4.4 Field Observations

4.4.1 Groundwater

The depth to resting groundwater levels were recorded during the groundwater monitoring rounds. A summary of the groundwater levels and evidence for contamination observed throughout the monitoring period is provided in Table 4-2.

Table 4-2 Groundwater Observations

Monitoring Well	Groundwater Encountered?	Range in Depth to Groundwater (m bgl)	Range in Groundwater Elevation (m AOD)	Inferred Aquifer Containing Groundwater[1]	Evidence for Contamination	Range of PID readings (ppm)
Onsite						
BH2498 BH2514	Yes	1.91–2.78/ 2.06–3.15	19.12–19.99 18.74–19.83	Made Ground	Strong sulphurous odour in both installations and black suspended solids in groundwater	0.1–1.0 0.0
BH2515	Yes	4.7–5.3	15.43–16.03	Made Ground	Slight hydrocarbon sheen on surface of groundwater	<0.1
BH2501 BH2516	Yes	1.03–1.89/ 1.18–2	18.69–19.55 18.55–19.37	Made Ground	N/A	0.0–0.2
BH2499 BH2518	Yes	0.34–1.25/ 0.34–1.04	19.48–20.39 19.72–20.42	Made Ground	Organic odour and cloudy water	0.0–0.1 0.0
BH2506 BH2520	Yes	0.24–0.93/ 1.26–2.05	19.5–20.19 18.36–19.15	Made Ground	Slight organic odour and black residue on pipework in the groundwater monitoring installation	0–0.1 0.5
BH2488 BH2526	Yes	0.77–2.61/ 1.36–2.11	17.88–19.72 18.36–19.11	Made Ground	Chemical odour	0–0.7 0.5
BH2484 BH2527	Yes	0.38–1.43/ 0.07–1.03	18.56–19.61 18.97–19.93	Made Ground	Strong sulphurous odour	0.0
BH2496 BH2513	Yes	1.22–2.36/ 1.34–2.18	18.96–20.1 19.15–19.99	Made Ground	N/A	0–0.2 0.0
BH2495 BH2517	Yes	2.49–3.03/ 2.51–3.73	19.32–19.86 18.65–19.87	Made Ground	Strong sulphurous odour, hydrocarbon sheen on groundwater, and hydrocarbon/metallic sheen on water in headworks	0–28.0 2.2
BH2497 BH2522	Yes	0.1–2.02/ 1.76–2.27	19.25–21.17 18.89–19.4	Made Ground	Slight hydrocarbon odour, black suspended solids in groundwater and black residue on data logger down the groundwater monitoring installation	0.5–1.1 1.7
BH2486 BH2524	Yes	1.21–1.77 2.13	18.71–19.27 18.31	Made Ground	Strong hydrocarbon/leachate odour and segregated water column in groundwater monitoring installation	0.0 0.0
WS02	Yes	-	-	Made Ground	-	0.0–0.4
WS03	Yes	-	-	Made Ground	-	0.0-0.1

The superficial deposits beneath the site are classified as a Principal Aquifer (Shepperton Gravel Member) and a Secondary A Aquifer (Alluvium). As such, these are considered to be moderately sensitive receptors although it should be noted that the site is not in a groundwater Source Protection Zone (SPZ). Groundwater in the region is also considered to be of a generally poor quality, associated with the surrounding landfill, nearby longstanding trading estate and the presence of Heathrow Airport; groundwater (Lower Thames Gravels) has a 'Poor' Quantitative Status under the Water Framework Directive classification scheme.

The majority of the site was previously underlain by the Shepperton Gravel Member; however, this has been subject to gravel extraction and infilling, which will have affected the properties of the aquifer and significantly reduced its resource potential and sensitivity. The north-east of the site is mapped to be underlain by superficial deposits of Alluvium, which is present in the form of relatively impermeable deposits of silt. This has not been proven in on-site boreholes to date, but off-site boreholes have identified clay deposits close to the river/channel. Superficial deposits are underlain by bedrock of the London Clay Formation, which overlies the London Lower Tertiaries (Superficial) and chalk Principal Aquifer, positioned at depth.

Groundwater levels across the majority of the site appear to be relatively level. Groundwater contour plans show that groundwater in the northern half of the site typically flows towards the east, with some northerly flow present in the north-west of the site. Flow direction in the south is generally inferred to the west; flow within the wider off-site landfill is notably variable, likely as a result of the heterogenous nature of the underlying waste materials. The contour plots were produced based on monitoring data provided from spring (April 2024), summer (August 2019), autumn (October 2024) and winter (December 2019) to capture seasonal variation in groundwater levels.

The nearest identified watercourse is the Poyle Channel located approximately 10m to the north of the site at its nearest point, which flows into the Colne Brook approximately 300m to the north-west of the site. Wraysbury Reservoir is also located 135m to the south of the site. Surface water within the Colne Brook waterbody and Wraysbury Reservoir Water Body were classified as being of 'Moderate'. Given the engineered nature of the reservoir the waterbody is likely to be lined with impermeable materials, preventing interaction with groundwater beneath the site. Based on publicly available surface water level data obtained from an upstream gauge approximately 300m to the east of the site, water level within the channel is located at an average depth of 20.6 mAOD. Groundwater levels beneath the site at the closest location to the channel (BH2516) during the same period (October 2024) were recorded at a depth of 19.11 mAOD. As this groundwater level is positioned towards the base of the water level of the Poyle Channel this indicates that the two water bodies are not in significant hydraulic continuity, limiting any potential interaction between the two waterbodies. This is further evidenced by the flow direction within the perched groundwater in the Made Ground being predominantly to the east with only limited flow recorded to the north in the north-east of the site towards the Poyle Channel. Local soakaways may also be influencing groundwater flow on-site.

5. Human Health Assessment

5.1 Assessment Approach

This assessment has been undertaken in general accordance with the current UK framework and comprises a GQRA as defined in LCRM[7]. Ramboll's assessment methodology is based on the Contaminated Land Exposure Assessment (CLEA) approach, further details of which are presented in Appendix 2.

LCRM requires that the use of Generic Assessment Criteria (GAC) is appropriate for a range of management and site-specific technical factors. In choosing the GAC for human health assessment, Ramboll has considered stakeholder requirements, the complexity of the conceptual site model, combined and cumulative factors, potential changes in site circumstances, uncertainties and limitations.

Ramboll has derived GAC for the interpretation of soil and groundwater chemical analyses. The GAC are threshold-based screening criteria below which a significant risk is not considered to be present. Contaminants at concentrations above the GAC do not infer an unacceptable risk; rather that further assessment is required to more fully understand potential contamination risks (as discussed below). Chemical analyses are discussed below and are provided in full in Appendix 5. Laboratory certificates are provided in Appendix 6.

In general, there will be limited personnel involved with day-to-day datacentre activities and the BESS will be unmanned with routine maintenance visits taking place.

5.2 Analytical Results - Soils

Table 5-1 summarises the contaminants identified at concentrations above the GAC in one or more samples; all other determinands analysed, were observed to be below adopted GAC (where available).

Table 5-1 Exceedances of GAC in Soils

Contaminant	Total No. of Samples	GAC (mg/kg)	No. of Exceedances of GAC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Distribution Comment
Metals						
Lead	101	2,300	1	<LoD	6,590 (BH2514, 2019)	Only one sample of lead recorded an exceedance of the GAC for lead. This was in BH2514 in the north-west corner of the site at a depth of 2.0m bgl.
VOCs						
Carbon Disulphide	15	6.7	3	<LoD	17.2 (BH2522, June 2019)	Exceedances of the GAC for carbon disulphide were recorded in two locations immediately off-site to the west, the first of which was recorded in a sample of the waste material in BH2522. Two samples were taken from BH2524, from the shallower waste material at approximately 3.0m bgl, which recorded a higher concentration of 12.4 mg/kg and then the underlying Made Ground at a depth of approximately 6.0m bgl, which had a concentration of 11.4 mg/kg. No exceedances were recorded on-site.

Notes: LoD – Limit of Detection

5.3 Asbestos

Table 5-2 provides a summary of the locations at which asbestos was detected, the outcome of the results of testing and details of observations made on site. Concentrations of asbestos below 0.01 % are considered to represent very low quantities, in accordance with current UK guidance provided by CL:AIRE[1].

Table 5-2 Asbestos Results - Detections

Location	Depth (m bgl)	Stratum	Asbestos Containing Material (ACM) Types Detected	Total % Asbestos in Sample
BH2514 (ES2)	0.1 – 0.2	Made Ground	Chrysotile – loose fibres in soil	<0.001
BH2514 (ES5)	1.2-1.3	Made Ground	Chrysotile – loose fibres in soil	0.967
BH2514 (ES8)	1.0 – 2.1	Made Ground	Chrysotile – loose fibres in soil (asbestos cement)	0.9667
BH2514 (ES14)	4.0 – 4.1	Waste	Chrysotile – fibre bundles in soil (asbestos cement)	0.4223
BH2515 (ES22)	3.5-2.6	Waste	Chrysotile – loose fibres	0.0273
BH2515 (ES25)	4.5 – 4.6	Waste	Chrysotile – loose fibres	-
BH2516 (ES2)	0.15 – 0.25	Made Ground	Chrysotile - traces	-
BH2516 (ES5)	0.-0.3	Made Ground	-	0.0172
BH2517 (ES2)	0.1-0.2	Made Ground	Amosite – loose fibres in soil	0.0144
BH2517 (ES4)	1.2 – 1.3	Made Ground	Amosite – loose fibres in soil	<0.001
BH2517 (ES11)	3.0 – 3.1	Made Ground	Amosite – soil containing ACM debris	<0.001
BH2517 (ES17)	5.0 – 5.1	Made Ground	Chrysotile – loose fibres in soil	0.0915
BH2518 (ES2)	0.0 – 0.1	Made Ground	Amosite – fibre bundles in soil	<0.001
BH2518 (15)	2.3	Made Ground	Chrysotile – loose fibres	<0.001
BH2519 (ES9)	1.0 – 1.1	Made Ground	Chrysotile – loose fibres in soil	<0.001
BH2520 (ES2)	0.0 – 0.1	Made Ground	Chrysotile – loose fibres	<0.001
BH2520 (ES18)	2.7 – 2.8	Made Ground	Chrysotile – loose fibres	<0.001
BH2520 (ES22)	4.7	Made Ground	Chrysotile – loose fibres Amosite – loose fibres	<0.001
BH2520 (ES24)	5.6 – 5.8	Made Ground	Chrysotile – loose fibres	<0.001
BH2521 (ES2)	0.0 – 0.1	Made Ground	Chrysotile – loose fibres	0.0058
BH2521 (ES5)	0.0 -0.1	Made Ground	-	0.0058
BH2522 (ES8)	0.9 – 1.0	Waste	Chrysotile – loose fibres in soil	0.0027
BH2522 (ES2)	2.5 – 2.6	Waste	-	0.0056
BH2522 (ES15)	2.5 – 2.6	Waste	Amosite – loose fibres in soil	0.0056
BH2522 (ES17)	3.5	Waste	Chrysotile, amosite – loose fibres	
BH2522 (ES24)	5.5 – 5.6	Made Ground	Amosite – loose fibres in soil	<0.001
BH2497 (ES5)	1.7 – 1.8	Made Ground	Chrysotile floor tile	
BH2523 (ES2)	0.0 – 0.1	Waste	Chrysotile – soil containing asbestos cement	0.5017
BH2523 (ES5)	1.0 – 1.1	Waste	Chrysotile – loose fibres	0.0039
BH2523 (ES9)	1.8 – 1.9	Made Ground	Chrysotile – loose fibres	<0.001
BH2524 (ES27)	5.9 – 6.0	Made Ground	Amosite – loose fibres in soil	<0.001
BH2524 (ES32)	6.5 – 6.6	Made Ground	Amosite – loose fibres in soil	<0.001
TP2558 (ES7)	1.55 – 1.65	Waste	Amosite - soil containing fibres typical of AIB	0.0091

[1] CL:AiRE 2016 Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Joint Industry Working Group CAR-SOIL

Location	Depth (m bgl)	Stratum	Asbestos Containing Material (ACM) Types Detected	Total % Asbestos in Sample
TP-2558 (ES10)	2.5 – 2.6	Waste	Chrysotile – loose fibres in soil Amosite – loose fibres in soil	0.0032
TP-2558 (-)	1.6 – 1.7	Waste	Chrysotile – loose fibres	0.0091

5.4 Human Health Discussion

Only lead was recorded in excess of its relevant GAC (2,300 mg/kg) at a concentration of 6,590 mg/kg in BH2514, located in the north-west corner of the site. Given the localised nature of this exceedance this is considered to be a contamination hotspot and not representative of a source of widespread contamination.

Exceedances of the GAC for carbon disulphide were recorded in two locations immediately off-site to the west, the first of which was recorded in a sample of the waste material in BH2522. Two samples were taken from BH2524, from the shallower waste material at approximately 3.0m bgl, which recorded a higher concentration of 12.4 mg/kg and then the underlying Made Ground at a depth of approximately 6.0m bgl, which had a concentration of 11.4 mg/kg. No exceedances were recorded on-site and as such this is not considered to be of significant concern.

Asbestos was encountered in 13 locations across and within 50m of the site to a maximum depth of 6.6m bgl in BH2524 off-site to the west. Of the quantification results recorded in excess of 0.01% only those recorded in BH2514, BH2515, BH2516 and BH2523 are located within the site boundary. Furthermore, the proposed design will result in a significant proportion of the site comprising concrete hardstanding or building footprint resulting in the site being 'capped', preventing any interaction between future site users with asbestos containing soils. It is understood that stripping of surface soils is likely as part of the demolition and construction phases at the site. Ramboll envisages that the asbestos detected could be appropriately managed by a competent contractor during the stripping of soils that may be undertaken as part of the proposed development. This will be further discussed in the outline remediation strategy,

No other contaminants of concern were detected above the relevant assessment criteria for a commercial end-use though are present at residual levels in the fill materials.

5.5 Construction Workers

This report and the GAC consider long term and chronic risk to humans based on defined exposure scenarios set out in the CLEA model and in CAR-SOIL for asbestos impacts. In some cases, contaminants may also pose acute hazards to workers at a site, or a worker's exposure scenario may differ from the scenarios considered when deriving the GAC.

As exposure times for construction workers are generally short term, risks from site contamination are generally addressed through the use of appropriate working procedures and the use of personal protective equipment (PPE) in line with the Management of Health and Safety at Work Regulations[2], Construction (Design and Management) Regulations[3] (for some sites) and the Control of Substances Hazardous to Health Regulations[4].

An Asbestos in Soils Management Plan would be required to provide a full assessment of risks to ground workers during construction and maintenance activities.

[2] UK Statutory Instruments (1999) The Management of Health and Safety at Work Regulation No. 3242
[3] UK Statutory Instruments (2015) Construction (Design and Management) Regulations No. 51
[4] UK Statutory Instruments (2002) Control of Substances Hazardous to Health Regulations No. 2677

5.6 Analytical Results - Groundwater (Human Health)

The groundwater analytical results obtained have been screened against commercial/industrial GAC; whilst a residential dwelling currently resides in the north-east of the site it is understood that no on-site residential receptors will be present following the redevelopment. As such, results screened against residential GAC are considered to be overly conservative and not representative of risk posed to potential human health receptors.

No exceedances of screening of groundwater samples against the commercial/industrial GAC were encountered, indicating that a viable groundwater volatilisation pathway is not present beneath the site. No exceedances of the GAC for a residential end use were recorded on or within the immediate vicinity of the site.

6. Water Environment Assessment

6.1 Assessment Approach

Risks to potential receptors in the water environment are assessed using GAC protective of each specific receptor. The potential receptors in the water environment which have been identified at this site comprise:

- Groundwater in residual volumes of the Shepperton Gravel Member;
- Groundwater in the off-site deposits of the Shepperton Gravel Member and Alluvium;
- Groundwater within the chalk Principal Aquifer at depth;
- Surface water within the Poyle Channel to the north of the site; and,
- Surface water in the Colne Brook and Wraysbury Reservoir off-site to the west and south.

LCRM requires that the use of GAC is appropriate for a range of management and site-specific technical factors. In defining appropriate GAC, Ramboll has considered stakeholder requirements, the complexity of the conceptual site model, combined and cumulative factors, potential changes in site circumstances, uncertainties and limitations.

The potential risk to the surface water environment from entry of pollutants (either directly or via a groundwater pathway) has been assessed using commonly accepted UK guidelines including country specific water regulations and the Environmental Quality Standards (EQS) defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC).

The potential risk to groundwater resources has been assessed using commonly accepted UK guidelines including groundwater resource protection values and drinking water standards. Assessment of the risk to these receptors is required using the appropriate GAC which are protective of that specific receptor. For those determinands included in the analytical suite which do not have corresponding European screening criteria derived from the above sources, UK-specific GAC are utilised. Where these are not available reference is made to other international guidance, further details of which are provided in Appendix 3.

6.2 Analytical Results

The groundwater and surface water results are compared to GAC protective of groundwater resources and GAC protective of the surface water environment. Table 6-1 provides a summary of the risk assessment for groundwater resources and Table 6-2 provides a summary of the risk assessment for the surface water environment. Exceedances of screening criteria do not infer that an unacceptable risk is present; the outcome of the screening is assessed further in the context of a qualitative source-pathway-receptor risk assessment.

The following determinands were not detected above or generally below the Laboratory Method Detection Limit (LMDL) and will not be discussed further in this report:

- The metals cadmium, selenium, vanadium and zinc;
- Phenols;
- BTEX (with the exception of benzene) or MTBE;
- Cyanide;
- VOCs with the exception of vinyl chloride and benzene;
- Semi-Volatile Organic Compounds (SVOCs);
- Polychlorinated Biphenyls (PCBs); and,
- Pesticides and herbicides -these were not detected above the LMDL during the February monitoring round and were generally below the LMDL during subsequent visits. As a result, these were excluded from testing during later July and October monitoring rounds.

Table 6-1 Risks to the Groundwater Environment

Contaminant	No. of Samples	GAC (µg/l) [Source]	Number of Exceedances of GAC recorded	Minimum Concentration (µg/l)	Maximum Concentration (µg/l)	Distribution Comment
Metals						
Arsenic	46	5 [G1]	14	<0.9	51.9 (BH2526, July 2024)	Elevated concentrations were consistently recorded on and directly off-site in the north (BH2513, BH2514, BH2517, BH2520 and BH2522). Samples taken from BH2526 and BH2527 in the south of the site and BH2520 off-site to the south-west also consistently exceeded the GAC.
Boron	44	750 [G2]	28	<3.0	2,244 (BH2517, Sep 2023)	Positions consistently recording exceedances of boron were typically located in the west of the site or immediately off-site to the west (BH2513, BH2514, BH2515, BH2517, BH2519, BH2522 and BH2524).
Iron	46	200 [G3]	1	<2.0	29,807.3 (BH2526, Oct 2024)	Exceedances located across the site, with higher concentrations recorded in the south.
Nickel	46	16.31 [G1]	14	<0.9	26.0 (WS02, Aug 2021)	One slightly elevated concentration of nickel was recorded on-site in WS02 in the north in 2021.
Organics						
Polycyclic Aromatic Hydrocarbons						
Anthracene	46	0.05 [G1]	15	<0.005	0.978 (BH2520, Feb 2024)	BH2520 recorded consistently elevated concentrations of Anthracene, which may relate to the infill in this area and is also downgradient of the USTs . Likewise, a result of 0.65 µg/l was recorded in WS03 installed in the UST vicinity. Exceedances of GAC were present across the north of the site, although at relatively low concentrations; no exceedances were noted across the south of the site.
Benzo(a)pyrene	46	0.005 [G1]	17	<0.005	4.888 (BH2520, Feb 2024)	The highest concentration on-site was recorded in BH2520, which is located downgradient of the fuel USTs. Relatively low exceedances of the GAC were recorded in the majority of locations across the site.
Benzo(b)fluoranthene	46	0.05 [G1]	9	<0.008	7.093 (BH2520, Feb 2024)	The number of exceedances were relatively low, with elevated concentrations recorded on and off-site in the north-west. No exceedances were recorded in the south of the site.
Benzo(g,h,i)perylene	46	0.05 [G1]	9	<LoD	4.301 (BH2520, Feb 2024)	Similar to other PAHs, the highest concentrations were recorded in BH2520. Other locations with marginal exceedances included WS03, BH2513, BH2516 and BH2522, with none recorded in the south of the site.

Contaminant	No. of Samples	GAC (µg/l) [Source]	Number of Exceedances of GAC recorded	Minimum Concentration (µg/l)	Maximum Concentration (µg/l)	Distribution Comment
Benzo(k)fluoranthene	46	0.05 [G1]	7	<LoD	2.759 (BH2520, Feb 2024)	Exceedances were consistently recorded at BH2520 throughout all monitoring rounds, with other elevated concentrations detected in WS03, BH2513 and BH2522 during the February 2024 monitoring round. No exceedances were recorded in the south of the site.
Fluoranthene	46	0.075 [G2]	17	<LoD	4.429 (BH2520, Feb 2024)	Exceedances were present across the north of the site, with none recorded in the south. More notably elevated concentrations were recorded in WS03 and BH2520.
Indeno(1,2,3-cd)pyrene	46	0.05 [G1]	9	<LoD	4.657 (BH2520, Feb 2024)	Elevated exceedances were associated with BH2520 and WS03. Exceedances were recorded at BH2513, BH2514, BH2516, BH2518, BH2522 and BH2526 in the February 2024 monitoring round.
Naphthalene	46	0.075 [G2]	3	<LoD	19.9 (BH2514, July 2024)	Elevated concentrations were recorded in BH2514 July and October 2024.
Sum of 4 PAHs	46	0.1 [G3]	10	<LoD	19.041 (BH2520, Feb 2024)	A sum of the PAHs benzo(b)fluoranthene, benzo(g,h,i)- perylene, benzo(k)fluoranthene and indeno(1,2,3- cd)-pyrene; exceedances recorded on-site were recorded in WS03, BH2516, BH2520 in the north of the site with significantly elevated concentrations isolated to BH2520.
Total Petroleum Hydrocarbons						
Aromatics						
C16-C21	46	90 [G4]	1	<LoD	190 (BH2513, Sep 2023)	Only one exceedance was recorded within 100m of the site to the north-west.
C21-C35	46	90 [G4]	2	<LoD	710 (BH2520, Feb 2024)	The highest elevations were localised to BH2520 on-site and BH2513 to the north-west.
Per and polyfluoroalkyl substances (PFAS)						
PFOS	23	0.1 [G3]	3	<LoD	3.6 (BH2517, July 2024)	Exceedances of PFOS were recorded in two locations; BH2517 in July and October 2024 and BH2513 in February 2024. No other exceedances for the GAC for PFOS have been recorded.
PFHxS	23	0.1 [G3]	2	<LoD	0.12 (BH2517, Oct 2024)	The two exceedances for PFHxS were recorded in BH2517 off-site to the west. No exceedances have been reported in downgradient.
PFPeA	23	0.1 [G3]	1	<LoD	0.37 (BH2526, Oct 2024)	Only one exceedance of PFPeA was recorded in the south of the site in October 2024.

Contaminant	No. of Samples	GAC (µg/l) [Source]	Number of Exceedances of GAC recorded	Minimum Concentration (µg/l)	Maximum Concentration (µg/l)	Distribution Comment
Total PFAS	23	0.5 [G5]	5	<LoD	4.3416 (BH2517July 2024)	Only two locations on-site recorded exceedances of EU Drinking Water Directive standards for total PFAS. These were BH2518 in the north and BH2526 in the south.
Volatile Organic Compounds						
Benzene	46	0.5 [G1]	1	<LoD	0.8 (BH2524, Sep 2023)	No exceedances on-site including from data around the USTs. An exceedance of the GAC for benzene was only recorded off-site to the west (BH2524) but not near the USTs.
Other Inorganics						
Ammoniacal Nitrogen	46	0.29 (mg/l) [G2]	39	0.03	25.74 (BH2522, Sep 2023)	Exceedances of the GAC for ammoniacal nitrogen were recorded at each borehole location. Since 2023, notably elevated concentrations on or in the immediate vicinity of the site (i.e. >5 mg/l) have been localised to BH2513, BH2514, BH2517, BH2522 and BH2524 along the western boundary.
Chloride	46	188 (mg/l) [G2]	3	5.1	254.9 (BH2517, Sep 2023)	No exceedances were recorded on-site. Exceedances were consistently recorded in BH2517 to the west of the site.
Nitrate as NO_3	46	37.5 (mg/l) [G2]	1	<LoD	45.2 (BH2526 (July 2024)	Only one location recorded an exceedance of the GAC for nitrate as NO_3 (BH2526) in the south of the site. However, no other exceedances have been recorded and the subsequent concentration in the October monitoring round was below the relevant GAC.
Sulphate as SO_4	46	188 (mg/l) [G2]	8	<LoD	402.5 (BH2527, Oct 2024)	Exceedances recorded on-site were located in BH2514, BH2516, 2518, BH2527, WS02 and WS03. Off-site locations within 50m of the site with exceedances were BH2513 and BH2522.

The following criteria have been used to select GAC:

- G1 – Hazardous substances in groundwater for waterbodies at 'High' WFD status: UKTAG Technical Report on Groundwater Hazardous Substances Sept 2016 plus accompanying Confirmed Hazardous Substances List (January 2018) - Concentration in Groundwater Below Which Danger of Deterioration in Receiving Groundwater is Avoided
- G2 – Non-hazardous substances in groundwater and waterbodies not at 'High' WFD status: WFD Threshold Values (TVs) for 'Good' Status. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015GW1 - UKTAG Technical Report on Groundwater Hazardous Substances Sept 2016 plus accompanying Confirmed Hazardous Substances List (January 2018).
- G3 – The EU Drinking Water Directive standards (Directive 98/83/EC on the Quality of Water Intended for Human Consumption)
- G4 - World Health Organization (WHO) guide values for TPHCWG fractions in drinking water
- G5 – EC Technical Guidance for Deriving Environmental Quality Standard, Annual Average (AA) for inland waters.

6.3 Controlled Waters Discussion

6.3.1 Risk to Groundwater Resources Potential

Groundwater in the Secondary A and Principal Aquifers beneath the site and off-site are considered to be sensitive receptors. Elevated concentrations of in-organic contaminants, including ammoniacal nitrogen, sulphates, chloride and metals including arsenic, boron, beryllium, lead and nickel were recorded in groundwater samples above GAC. The concentrations of contaminants present in the south and north of the site are therefore considered to be associated with the historic infilling that occurred on-site and off-site. Whilst elevated concentrations of metals were recorded across the site with the exception of iron and arsenic, which was consistently recorded at elevated concentrations in the south of the site, these were generally sporadic with no obvious trend observable. Metals are considered to be relatively immobile contaminants and the absence of exceedances of relevant GAC downgradient of known hotspots indicates that there is not significant lateral migration of metals within groundwater. Exceedances recorded for sulphate, chloride and nitrate are all considered to be marginal in comparison to EQS.

Ammoniacal nitrogen, whilst elevated in concentration across the site was not observed in significant concentrations in surface water samples taken from nearby surface water features. Since 2023, notably elevated concentrations of ammoniacal nitrogen on or in the immediate vicinity of the site (i.e. >5 mg/l) have been localised to BH2513, BH2514, BH2517, BH2522 and BH2524 along the western boundary. The only location on-site with significantly elevated concentrations was BH2514, with a maximum concentration of 11.83 mg/l in July 2024 compared to the GAC of 0.29 mg/l. This is located along the north-west boundary, indicating that on-site migration of ammoniacal nitrogen from the wider landfill is likely not occurring. Furthermore, BH2513 which is downgradient and positioned to the north-west of the site consistently recorded lower concentrations than those in BH2514.

PFAS were detected in groundwater samples collected during all monitoring visits at very low concentrations, which is not unexpected given the ubiquitous nature of this contaminant in the environment. In Ramboll's experience the Environment Agency apply a value of 0.1 µg/l for each subset of PFAS compounds, which is based on the drinking water wholesomeness standard of 100ng/l. Concentrations of PFOS and PFHxS were encountered in excess of relevant GAC in BH2517 and BH2513, both of which are situated off-site to the west. Groundwater contour plots show that groundwater in these locations does not flow on-site limiting potential for on-site migration. In addition, no concentrations were detected above the GAC (<0.65ng/l) in the nearby on-site BH2520. One exceedance of total standard for PFPeA (0.1 µg/l) was recorded in BH2526 in the south of the site (0.37 µg/l) during the October 2024 monitoring round. It should be noted that the concentration was generally low and no other exceedances of PFPeA were detected during any of the other monitoring rounds.

Only two locations on-site recorded exceedances of EU Drinking Water Directive standards for total PFAS (0.5 µg/l). These were BH2518 in the north at a concentration of 0.52 µg/l and BH2526 in the south at a concentration of 1.5 µg/l. The total concentration of PFAS in BH2518 and 0.28 µg/l of BH2526 comprised PFBA, which is a short chain PFAS compound (i.e. with six or fewer perfluorinated carbons) and can be a breakdown product of other PFAS. It is not considered to be easily transformed/degraded by hydrolysis or photolysis in water to any appreciable extent and neither biodegradable under aerobic or anaerobic environmental conditions in water or soil. Short chain PFAS tend to be more soluble in water, than long chain PFAS, thereby having a higher potential for aqueous transport. However, the bioaccumulation potential of short-chain PFAAs is lower than that of long chain PFAAs. The site is not located in a drinking water zone.

Concentrations of PAHs above the GAC were noted to be most commonly present in BH2520. The singular exceedance of the TPH aromatic C21-C35 fraction (710 µg/l against the GAC of 90 µg/l) on-site was similarly recorded in BH2520, although this fraction has very low mobility, mitigating risk of lateral migration within the aquifer. It is unclear if the concentrations relate to the Made ground at this location or the USTs. Whilst flow direction in the north of the site is generally inferred to the east, the lower permeability Alluvium in the north-east extending off-site to the east is considered to be a mitigating factor in potential off-site lateral migration of residual contamination in groundwater.

No observable seasonal trend in the concentrations of contaminants was recorded in samples of groundwater, although exceedances were typically recorded in the same locations during all monitoring rounds.

Along the north-west site boundary groundwater typically flows in a more northerly direction, however, the presence of the Poyle Channel to the north is considered to limit hydraulic continuity with the off-site aquifer. Furthermore, the presence of reworked clay type Made Ground overlying the gravels present along the northern boundary is considered to limit permeability along the site boundary and a separate landfill is located to the north.

The deeper chalk Principal Aquifer is considered to be protected from the downwards migration impacted groundwater by the presence of the underlying impermeable London Clay bedrock. It is understood that piling on-site is unlikely to penetrate the clay that extends to ~40m in thickness in this area. Surface water impacts are assessed further in the risk assessment below.

Table 6-2 Risks to the Surface Water Environment

Contaminant	No. of Samples	GAC (µg/l) [Source]	Number of Exceedances of GAC recorded	Minimum Concentration (µg/l)	Maximum Concentration (µg/l)	Distribution Comment
Metals						
Arsenic	46	50 [S1]	1	<LoD	51.9 (BH2526, July 2024)	Only one exceedance of the GAC for arsenic was recorded in BH2526 in the south of the site during the July 2024 monitoring round. However, during the subsequent October 2024 monitoring round concentrations had dropped below the GAC exceedance level.
Boron	46	2000 [S1]	3	<LoD	4,370 (BH2513, Oct 2019)	Exceedances of boron were isolated to BH2517 and BH2522; No on-site borehole samples recorded significantly elevated concentrations.
Chromium	46	4.7 [S1]	2	<LoD	8.9 (BH2516, Oct 2024)	Two exceedances were recorded in the north of the site during the October 2024 monitoring round; these were located in BH2516 and BH2518. No other exceedances were recorded.
Copper	46	6.81 [S1, EQS bioavailable]	10	<LoD	46 (BH2526, Sep 2023)	Exceedances on site were recorded in BH2526 and BH2527 in the south and BH2514 and BH2520 in the north.
Iron	44	1000 [S1]	22 [1]	<LoD	33,388 (BH2526, Sep 2023)	Exceedances of iron were recorded across the site and the wider landfill to the west. Notably higher concentrations were recorded in the south of the site (BH2526 and BH2527).
Lead	46	1.2 [S2, EQS bioavailable]	1	<LoD	1.8 (BH2520, Oct 2024)	Only one exceedance of the GAC for lead was recorded on-site in BH2520 during the October 2024 monitoring round. Concentrations of lead across the majority of samples were not recorded above the LOD.
Organics						
Polycyclic Aromatic Hydrocarbons						
Anthracene	46	0.1 [S2]	9	<LoD	0.987 (BH2520, Feb 2024)	Concentrations were recorded above the GAC across the site, with more locally elevated readings encountered in BH2520.
Benzo(a)pyrene	46	0.00017 [S2]	21	<LoD	4.888 (BH2520, Feb 2024)	
Benzo(b)fluoranthene	46	0.00017 [S2]	17	<LoD	7.093 (BH2520, Feb 2024)	
Benzo(g,h,i)perylene	46	0.00017 [S2]	11	<LoD	4.301 (BH2520, Feb 2024)	
Benzo(k)fluoranthene	46	0.00017 [S2]	11	<LoD	2.759 (BH2520, Feb 2024)	
Fluoranthene	46	0.0063 [S2]	36	<LoD	4.429 (BH2520, Feb 2024)	
Indeno(1,2,3-cd)pyrene	46	0.00017 [S2]	18	<LoD	4.657 (BH2520, Feb 2024)	
Naphthalene	46	2 [S2]	2	<LoD	19.9 (BH2514, Jul 2024)	Exceedances of the GAC for Naphthalene were only recorded in BH2514 during the July and October 2024 monitoring rounds.

Contaminant	No. of Samples	GAC (μg/l) [Source]	Number of Exceedances of GAC recorded	Minimum Concentration (μg/l)	Maximum Concentration (μg/l)	Distribution Comment
Total Petroleum Hydrocarbons						
Aliphatics						
C8-C10	46	10 [S3]	1	<LoD	27.0 (BH2524, Sep 2023)	Only one exceedance of the GAC for the C8-C10 fraction was recorded in BH2524 off-site to the west.
Aromatics						
C12-C16	46	10 [S3]	1	<LoD	40.0 (BH2513, Sep 2023)	No exceedances were recorded on-site, with the closest recorded in BH2513 to the north-west.
Per and polyfluoroalkyl substances (PFAS)						
PFOS	23	0.65 ng/l [S4]	12	<LoD	3.6 (BH2517, July 2024)	Relatively low exceedances for the EQS for PFOS were recorded on-site in BH2516, BH2518 and BH2520 in the north and BH2526 in the south. All others were situated off-site to the west.
Other Inorganics						
Ammoniacal Nitrogen	46	0.6 (mg/l) [S1]	35	0.03 (mg/l)	25.74 (BH2522, Sep 2023)	Exceedances of the GAC for ammoniacal nitrogen were recorded at the majority of borehole locations in August 2021 and September 2023. However, since then elevated concentrations on-site have been limited to BH2514,BH2516 and BH2518 in the north and BH2526 and BH2527 in the south.
1,4-Dioxane	23	0.46 [S5]	3	<LoD	46.5 (BH2517, April 2024)	Three locations recorded concentrations of 1,4-dioxane above EQS; these were BH2517 and BH2522 off-site to the west and BH2514, located in the north-west corner of the site. No exceedances were recorded during the following July and October monitoring rounds.
Sulphate as SO4	46	400 [S1]	1	<LoD	403.5 (BH2527, October 2024)	Exceedances on-site were localised to BH2527 in the south during the October 2024 monitoring round.

The following criteria have been used to select GAC:

S1 – Specific and other pollutants in surface water: The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 or where not available EA EQSs to be utilised in surface water risk assessments as part of environmental permit applications and WFD assessments of works in coastal and transitional waters in England.

S2 - Priority substances in surface water and selected (other determinands to which this policy relates): 2013/39/EU: Priority Substances in the Field of Water Policy Directive and 2008/105/EC: Environmental Quality Standards in the Field of Water Policy Directive

S3 - World Health Organization (WHO) guide values for TPHCWG fractions in drinking water

S4 – EC Technical Guidance for Deriving Environmental Quality Standard, Annual Average (AA) for inland waters

S5 - Tap Water standard for US Environmental Protection Agency (EPA) Regional Screening Levels

6.3.2 Risk to Surface Water Environment

Exceedances in relation to surface waters typically followed trends observed throughout the groundwater screening. Ammoniacal nitrogen is considered to be the primary risk to surface water quality given the significantly elevated concentrations recorded and its widespread nature across the site. However, concentrations recorded in the downstream surface water sample of the Colne Brook were generally the same if not lower than upstream samples from the Poyle Channel and the Colne Brook, which were both notably low in concentration. This indicates that residual contamination in groundwater beneath the site is not migrating laterally into adjacent surface water features, and therefore a significant risk has not been identified.

With the exception of widespread iron and copper exceedances, elevated concentrations of metals were generally sporadic across the site or located off-site within the wider landfill area. Both copper and iron were not recorded in significant concentrations in any of the surface water samples tested.

No exceedances of aromatic of aliphatic TPH fractions were recorded on-site. Concentrations of PAHs were generally recorded across the site, with more locally elevated readings recorded in BH2520. Concentrations of the PAH benzo(a)pyrene, the most widespread PAH, were noted to be present in excess of GAC (0.00017 µg/l) in surface water samples taken from the Colne Brook and Channel; however, the highest concentrations were typically present in the upstream samples, such as the concentrations of 0.007 µg/l recorded in both locations compared to concentrations below the LoD in the downstream sample and the borehole positioned closest to the Poyle Channel (BH2513). This indicates that potentially residual contamination in groundwater beneath the site is not the source of elevated concentrations in nearby surface water receptors and that higher concentrations are likely reflective of the poor water quality of the region associated with surrounding land uses such as the nearby industrial estate, historic landfills and Heathrow Airport.

1,4-dioxane was recorded in three locations exceeding EQS from February 2024 to April 2024, although only one of these was located on-site in BH2514 in April 2024 (45.7 µg/l against an EQS of 0.46 µg/l), which is located along the north-west boundary; however, there were no correspondingly elevated concentrations of 1,4-dioaxane in downstream samples and no exceedances of the surface water EQS were recorded from April onwards.

Concentrations of PFOS were recorded in BH2516 (0.0184 µg/l), BH2518 (0.0598 µg/l) and BH2520 (0.05 µg/l) in the north of the site and BH2526 (0.1 µg/l) in the south. The majority of recorded concentrations are considered to be marginal exceedances of the EQS protective of the surface water environment (0.00065 µg/l) and a significant 'high-risk' source of PFAS has not been identified on-site. Further, the PFOS EQS of 0.00065µg/l is based on protection of human health relating to the consumption of biota (i.e. fishery products). Further Quality Standards are set protective of the pelagic community receptors and then secondary predators of the pelagic community at 0.23µg/l and 0.002µg/l respectively, as set out in the EQS dossier for PFOS. Concentrations on-site were generally below the 0.23µg/l and above the 0.002µg/l standard. However, limited connection to surface water receptors has been identified as discussed below.

As stated previously given the difference in water level elevation between the Poyle Channel and the groundwater underlying the site, the two water bodies are likely not in significant continuity. Further, groundwater flow across much of the north of the site flows eastwards and not towards the Poyle Channel further indicating the lack of significant continuity. This along with the low permeable clay Made Ground/reworked Alluvium deposits along the northern boundary limit potential interaction between the two waterbodies, which is reflected in the significantly lower concentrations of contaminants recorded in all surface water samples. Potential risks to surface water receptors to the west and south, including the Colne Brook and Wraysbury Reservoir, are considered to be limited given their distance from the site.

7. Ground Gas Assessment

7.1 Assessment Approach

Ground gases can be produced as a result of the decomposition of organic materials and may also originate from natural sources, such as coal seams and organic-rich soils. The principal components of ground gas are methane and carbon dioxide, although other gases may be present in trace concentrations. Ground gases can present a hazard to site occupants and property as result of flammable / explosive hazards, physiological effects, odour and effects on vegetation. The ground gas assessment included in this report is provided for indicative purposes only and is not intended for use as a detailed ground gas risk assessment.

Ramboll has applied a semi-quantitative method in line with current good practice guidance on risk assessment to assess ground gas risks. Full details of Ramboll's assessment methodology are presented in Appendix 2.

7.2 Ground Gas Monitoring Results

Potential ground gas sources at or in the vicinity of the site, and subject to assessment comprise:

- Potential Source 1: Made Ground associated with infilled land on and off-site;
- Potential Source 2: Potential diesel fuel contamination associated with the below ground storage tank; and,
- Potential Source 3: Historic and contemporary light industrial land uses

In order to characterise the ground gas regime, 9 no. monitoring rounds were carried out between August 2019 to October 2024. The number and frequency of monitoring rounds was based on guidance provided within CIRIA C655[5]. The ground gas monitoring results are provided in full in Appendix 7.

7.3 Results and Discussion

7.3.1 Atmospheric Pressure

The lowest pressure recorded was 983mb in October 2019, whilst the highest atmospheric pressure recorded being 1022mb in April 2024.

7.3.2 Flow Rates

Peak gas flow rate was recorded during monitoring rounds. The flow rates were often recorded below the instrument detection level (<0.1 l/hr) at all well locations, with the exception of 23 recordings, albeit the majority if these were fairly low or negative flow rates of <0.3 litres per hour, with no obvious correlation between flow and atmospheric pressure. The maximum value recorded was 14.2l/hr at BH2484, which was consistently high in most monitoring rounds; this is located in the far south-east of the site on the southern edge of the BESS development area. Also within the BESS development area in the south were moderately elevated flow rates recorded on two occasions in BH2588 (maximum flow of 3.9 l/hr) and BH2490 (maximum flow of 4.4 l/hr).

Positive flow of between 1.7 l/hr and 10,5 l/hr was recorded in BH2506 long the southern edge of the datacentre development area on three out of ten occasions, with the higher flow rates corresponding with low atmospheric pressure conditions. In BH2499, which is located in the centre of the datacentre development area and in the vicinity of the decommissioned USTs positive flow rates were recorded on three out of ten occasions, with a maximum rate of 8.3 l/hr recorded in December 2019.

[5] Assessing risks posed by hazardous ground gases to buildings; CIRIA C665, 2007

7.3.3 Methane and Carbon Dioxide

The highest recorded methane concentrations for each location were recorded above the lower instrument detection limit (<0.1 % by volume (v/v)) in 119 borehole readings, with a maximum on-site concentration recorded in BH2507 in the north of the datacentre development area (92.5% v/v). The maximum concentration of methane in the south of the site was recorded in BH2588 at a concentration of 89.6% v/v.

The highest recorded carbon dioxide values were recorded above the lower instrument detection limit in 197 readings, with a maximum concentration on-site recorded in BH2488 (13.0% v/v). Readings were predominantly less than 10% v/v. Concentrations were generally quite variable with certain wells recording methane at <0.1% and there was no clear spatial distribution of the elevated concentrations. The elevated concentrations are expected to relate to the variable nature of the infill material on-site.

7.3.4 Oxygen

Minimum oxygen was measured in 2023 and 2024, resulting in 15 minimum values of 0% out of 61. The maximum value was 21.8% at BH2496.

7.3.5 Carbon Monoxide

Carbon monoxide was detected at concentrations above the lower instrument detection limit (<1 ppm) at 28 measured borehole locations. The maximum was 21ppm at BH2488, followed by 11ppm at BH2495.

7.3.6 Hydrogen Sulphide

Hydrogen sulphide was detected at concentrations above the lower instrument detection limit (<1 ppm) at 33 measured borehole locations. The maximum was at 37ppm at BH2495, followed by 35ppm at BH2488.

7.3.7 Volatile Organic Compounds (VOCs)

During the ground gas monitoring a photo-ionisation detector (PID) was used to screen for the potential presence of VOCs within the monitoring wells; 39 of the 150 readings taken in 2019 were above the instrument detection limit of 0.1ppm. The maximum was 4.4ppm recorded in BH2497, which is off-site to the west followed by 3.5ppm at BH2489, which is situated in the central strip of the site. In Ramboll's experience these readings are not significantly elevated and no soil or groundwater GAC exceedances attributable to vapour risks have been identified. No significantly elevated VOC concentrations were recorded within the vicinity of the decommissioned USTs.

7.3.8 Monitoring Frequency

The number and frequency of monitoring rounds was assessed with reference to guidance provided within BS8576.

In total fifteen rounds of spot monitoring data are available as generated within the last five years. This is considered reasonable given CIRIA C665 identified an idealised period of monitoring for a low sensitivity commercial use on a site classed as high-risk relating to gas potential as 12 months/rounds (with at least two rounds at low or falling pressures and Ramboll notes that data from 05/11/2019 and 08/10/2024 recorded low atmospheric pressures of <1000mb).

7.4 Classification of Ground Gases

Details of Ramboll's assessment methodology is presented in Appendix 2 and a discussion of the results is provided below. The risk posed by ground gases has been assessed by calculating a Gas Screening Value (GSV) based on a worst-case scenario of the maximum flow rate recorded in a given area and the maximum gas concentration (with individual GSVs calculated for both methane and carbon dioxide).

The GSV has been calculated by multiplying the steady state flow rates and gas concentrations; as summarised in Table 7-1.

The GSV is used to support assessment of the site's characteristic situation (CS). Where negative flow was recorded this was included in the GSV calculations as suggested by BS8485 – however the negative flow rates were generally fairly low and are not considered to be significant in the outcome of the GSV status.

The site is to be developed as a datacentre and BESS and each area has been considered separately given the differing nature of the development and that the source potential is subtly different with the BESS area located fully on landfilled ground, whereas the datacentre is only partially located on ground classed as a landfill with the majority located on a mixed fill formed of reworked natural deposits and construction materials.

Table 7-1 Ground Gas Assessment

Potential Source	Maximum Flow Rate (l/hr)	CO_2		CH_4		Characteristic Situation
		Maximum Gas Concentration (% v/v)	GSV (l/hr)	Maximum Gas Concentration (% v/v)	GSV (l/hr)	
North (Datacentre)	10.5	11.1	1.17	92.5	9.71	4 – Moderate to High Risk
South (BESS)	14.2	13	1.85	89.6	12.72	4 – Moderate to High Risk

Based on BS8485[7]

Based on a worst case GSV calculation the site is classified as 'Characteristic Situation 4' (CS4, that corresponds to a moderate to high hazard) in BS8485. However, Ramboll considers there are a number of factors that would indicate a Characteristics Situation 3 is more applicable to the proposed development, particularly for the datacentre area given the age of the fill (1960's to 1980's) and the limited depth of approximately 5.0-6.0m fill as a gas source.
Whilst elevated flow rates were identified in three locations in the datacentre development area it should be noted that ground gas volumes recorded at these locations were not correspondingly high. As a result, only BH2499 in the area of the decommissioned USTs contained volumes of methane and an elevated flow rate that would result in a CS4 Characteristic Situation classification. All other locations in the north of the site corresponded with a CS2 (three locations) or CS1 (six locations) when characterised independently.

With the exception of flow in BH2484 which consistently exceeded 9 l/hr in 2019, flow rates in the south of the site were generally recorded at 0.1 l/hr. As a result, three out of the five locations when individually characterised correspond with CS1 or CS2 with only BH2488 and BH2484 corresponding to CS3.

In Ramboll's opinion the individual results are considered to be more reflective of the expected Characteristic Situation at the site given the variable nature of the fill. Based on Ramboll's most recent data from September 2023 to October 2024 flow rates at the site were consistently lower than those recorded in 2019 with a maximum flow rate of 0.5 l/hr recorded in BH2488. As such Ramboll considers that a CS4 classification for the site is not representative, alongside the fact that no borehole flow rates exceeded 70 l/hr, which is a qualifying factor to escalate CS2 to CS3 according to C665.

It would be prudent to undertake further investigation of the gas source beneath the datacentre building and to use to continuous monitoring techniques to further assess using quantitative techniques the characteristic situation during the detailed design stage. However, for now a CS3 rating should be assumed based on the available data.

The design of future buildings on site will need to take into account the findings of this gas risk assessment and will need to consider the incorporation of ground gas protection measures for the proposed use of the site. The requirement and design of gas protection measures will need to be implemented in line with guidance provided in BS8485, which includes consideration for the building’s construction and use.

8. Source-Pathway-Receptor Risk Assessment

8.1 Updated Conceptual Site Model

The information presented in the previous sections of this report has been collated and evaluated to refine the preliminary conceptual site model for the site.

8.1.1 Qualitative Risk Assessment

The PCLs which were identified at PRA stage as posing a potentially significant risk are considered further by reassessment based on the ground investigation findings. This forms a qualitative risk assessment.

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed in Appendix 2. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways between them.

This qualitative risk assessment has been undertaken by definition of risk categories in accordance with NHBC and EA guidance, further details of which are provided in Appendix 2.

Table 8-1 summarises the updated assessment of PCLs and risk categories associated with the proposed development as assessed following interpretation of the results of the ground investigation.

Table 8-1 Updated Conceptual Site Model

Source	Pathway	Potential Receptor	Potential Consequence	Probability Risk	Level of Risk
On-Site Sources					
Gravel extraction, processing and washing activities, infilled ground and landfilling (various contaminants associated with the presence and degradation of waste materials including organic and inorganic contaminants, including, but not limited to, ammoniacal nitrogen, dioxins and perfluorinated compounds) Former builders yard activities Presence of two former USTs (1940's to 1980's) (diesel) in the northern- portion of the site Electricity substation (oils and PCBs) in the northern- portion of the site	Leaching to Groundwater and Groundwater Flow	Off-site Principal Aquifer	Mild	Low Likelihood	**Low**
		Secondary A Aquifer/ Principal Aquifer (beneath the London Clay)	Mild	Low Likelihood	**Low**
		Surface watercourses (Poyle Channel)	Medium	Low Likelihood	**Low**
		Surface watercourses (Colne Brook)	Mild	Unlikely	**Very Low**
		Future site users	Severe	Unlikely	**Low to moderate**
		Construction Workers	Severe	Likely	***Low**
		Adjacent site users	Medium	Unlikely	**Low**
		Future site users	Severe	Low Likelihood	**Moderate**
		Adjacent site users	Medium	Low Likelihood	**Low**
		On-site buildings and structures	Severe	Low Likelihood	**Moderate**
Off-Site Sources					
Industrial/Trading Estate to the east Landfills adjacent to the west and north and in the wider surrounds Potential contaminants include heavy metals, petroleum hydrocarbons, PAHs, VOCs, SVOCs, PCBs, asbestos and elevation concentrations of ground gases.	Leaching and movement on to site via Groundwater Flow	On-site groundwater in Principal and Secondary Aquifers	Mild	Low Likelihood	**Low**
		On-site buildings and structures	Medium	Low Likelihood	**Low to moderate**
		Future site users	Medium	Unlikely	**Low**

Notes: *Given the use of appropriate PPE and on-site health and safety precautions, risk to construction workers would be reduced to low. See remediation strategy.

Risks identified as being moderate or higher are considered to be significant and are therefore PCLs of concern for which further actions are required.

8.2 Climate Change Considerations

The UK Government and devolved administrations have produced climate change adaptation programmes, including plans for both mitigating and adapting to climate change. SDGs support the development of Sustainable Cities and Communities (SDG No. 11), Clean Water and Sanitation (SDG No.6), sustainable ecosystems (SDG No.14. Life below Water and SDC No. 15 Life on Land). It is therefore important to recognise how changes in weather/season/climate could affect the ground conditions that were encountered during the investigation.

Climate change projections[6] demonstrate that in the UK the following conditions are expected to result from future climate change: drier and hotter summers, wetter and milder winters, a higher frequency of intense rainfall periods and sea level rise. The following are considered relevant to the assessment:

- Wetter weather – causing increased leaching and runoff, increased contaminant mobilisation, and changes to locations of surface water receptors;
- Higher water table – mobilisation of contaminants which are currently within the unsaturated zone, mobilisation through pathways such as service/drainage routes that previously were above the water table and new groundwater-surface water interaction;
- Greater fluctuation of water table –changes to groundwater discharge locations and flow directions; and,
- Temperature changes – changes to the stability/degradation and volatilisation rate of contaminants in soil/groundwater.

However, the proposals to redevelop the site will further limit the potential for infiltration and likely reduce groundwater levels further reducing the risk profile and potential for migration of groundwater to nearby surface waters.

[6] Meteorological Office UK (2018). UKCP18 Land Projections: Science Report. Updated March 2019.

9. Conclusions and Recommendations

9.1 Conclusions

Ramboll has produced this GQRA to assist in the proposed demolition of existing buildings and site re-levelling, erection of a building for use as a data centre, erection of a sub-station, a Battery Energy Storage System (BESS), as well as associated external works and utility infrastructure, site access works, internal circulation routes and landscaping at the Manor Farm site in Poyle, Slough. Information used to inform this assessment was taken from multiple phases of ground gas and groundwater monitoring undertaken between August 2019 and October 2024.

Evidence of residual contamination encountered was consistent with the historic use of the south and the north-west side of the site as a landfill and the north-east of the site for light industrial/ commercial land uses that has also been subject to infilling (as reworked construction and natural materials).

Receptors identified of being at risk from potential ground and groundwater contamination beneath the site include current and future site users. Whilst an isolated area of lead contamination was identified in the north-west corner of the site this is considered to be localised and not evidence of gross contamination. It is understood that the proposed redevelopment will result in the majority of the site comprising building footprint or concrete hardstanding at ground surface. This would essentially cap the site, acting as a physical barrier and meaning that a feasible pathway for interaction with contaminated soils is not present. Furthermore, the capping of the site is expected to reduce infiltration, preventing leaching of any residual shallow ground contamination to underlying groundwater.

No exceedances of screening of groundwater samples against the GAC for a commercial/ industrial development were encountered, indicating that a viable groundwater volatilisation source is not present beneath the site.

Asbestos was recorded in 13 locations on and in the immediate vicinity of the site at concentrations that range from <0.001% to 0.967% and that exceed the hazardous waste thresholds in a number of samples (relevant only for soil disposal aspects). Risks to construction workers are considered to be mitigated through the provision of appropriate PPE and good environmental site practices. Further consideration of asbestos risks is captured in the outline remediation strategy that accompanies this report.

The presence of residual and elevated concentrations of contaminants including ammoniacal nitrogen, iron and petroleum hydrocarbons in groundwater is considered to be typical of a site subject to variable filling and whilst there is contamination present the potential for this to represent a significant risk to wider groundwater or surface waters is considered to be limited. Petroleum hydrocarbon contamination identified locally close to the UST in the north of the site is also considered to be associated with the presence of the now decommissioned diesel USTs; however, it is understood that below ground fuel infrastructure will be removed as part of the development.

Whilst exceedances of inorganic and organic contaminants were recorded in excess of relevant GAC or EQS protective of the surface water and groundwater environments, the presence of low permeability le clayey Made Ground/reworked alluvium deposits along the boundary is expected to act as a mitigating factor to off-site contaminant migration. Likewise, deposits of low permeability Alluvium along the east of the site are expected to limit lateral migration that could potentially impact the off-site superficial aquifer. The deeper chalk Principal Aquifer is considered to be protected from the vertical migration of impacted groundwater due to the presence of the underlying impermeable London Clay bedrock.

The difference in elevation between groundwater beneath the site and surface water levels within the nearby Poyle Channel indicates that the two waterbodies are not in significant hydraulic continuity. In addition, no correspondingly increased concentrations of contaminants have been recorded in surface water samples taken from the Poyle Channel or Colne Brook. This indicates that contaminated groundwater beneath the site is not interacting with nearby surface waters, and therefore no potential risk has been identified.

Based on HAL's ground gas monitoring from 2019 the ground gas regime beneath the site corresponds with Characteristic Situation 4; however, Ramboll's most recent monitoring data from September 2023 to October 2024 recorded concentrations and flow rates consistent with a Characteristic Situation 3 classification, which is typical of old landfill sites. As such Ramboll considers that a CS4 classification for the site is not representative. It would be prudent to undertake further investigation of the gas source beneath the datacentre building and to use continuous monitoring techniques to further assess using quantitative techniques the characteristic situation during the detailed design stage.

The identified contamination is considered to be manageable in the context of the proposals of a low sensitivity commercial use. Furthermore, the proposals will improve the existing site conditions and remove obvious sources of contamination (e.g. the underground storage tanks) during the works. The site is considered suitable for commercial development subject to the further recommendations set out below.

9.2 Sustainability

The findings discussed within this report support sustainable development of the site; through strategic sampling and analysis of various environmental media including soil and groundwater, combined with technically robust investigation and risk assessment processes. This facilitates proportionate and scientifically justifiable recommendations to reduce risks to humans and ecosystems alike. It allows for development of sustainable remedial measures and management of soils.

9.3 Recommendations

The assessments undertaken herein have resulted in the identification of a number of plausible pollutant linkages that require further investigation or remedial intervention in order to deliver a site that is suitable for use for the proposed development. Ramboll recommends the following:

- Further investigation is recommended to delineate areas of potential contamination and provide ground and groundwater information in areas of data gaps to support a robust remediation design.
- On-going groundwater monitoring is recommended prior to, throughout and following the construction phase.
- Ground gas protection measures in line with requirements of CS3 should be included in the design of all buildings on site (including smaller buildings associated with the BESS). Continuous monitoring and detailed risk assessment is recommended to refine the gas protection measures.
- As standard for a redevelopment a 'remedial strategy' should be prepared that outlines good environmental practices and precautions that should be followed during redevelopment works.

- In accordance with good practice in developing brownfield land, it is recommended that a watching brief is implemented during ground works to identify unforeseen ground conditions or localised contamination hotspots (e.g. concentrated pockets of asbestos or hydrocarbons), especially during the removal of the decommissioned fuel tank and associated infrastructure (e.g. pipework). If previously unforeseen contamination is identified, the risk assessment should be updated accordingly.
- Material re-use aspects are considered in more detail in the outline remediation strategy.
- Surface water features such as swales as part of the development should be designed/lined to prevent interaction with any potentially impacted underlying groundwater.