



Capital City College Group

Tottenham Centre

Geo-environmental and Geotechnical Assessment

1922791-01(00)

RSK GENERAL NOTES

Project No.: 1922791

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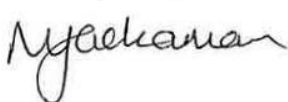
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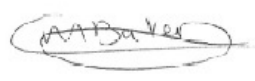
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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

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EXECUTIVE SUMMARY

Commissioning and purpose of assessment	RSK Environment Limited (RSK) was commissioned by by Peter Marsh Consulting Ltd on behalf of Capital City College Group to carry out a Preliminary Risk Assessment and Geo-environmental and Geotechnical Assessment of the land at Tottenham Centre, The College of Haringey, High Rd, London, N15 4RU, 533598,189294. The overall aim of the project was to assess land contamination sources and geotechnical constraints to the proposed development.
DESK-BASED ASSESSMENT	
Site description and proposed development	The site, currently comprises an active college facility, that occupies an area of 1.19 hectares, is being considered for redevelopment with a new 4 No. storey STEM building.
History of site and surrounding area	Historically, the site was occupied by residential properties, before becoming a part of Tottenham College from circa 1950s. Several potentially contaminative current and historical activities have been identified in the surrounding area, including storage tank adjacent to the south east, dry cleaning services 58m east, infilled pits 100m south and a railway 100m west.
Previous site investigation (SI) reports	There are no previous SI reports available.
Geology and environmental setting	The site is underlain by London Clay Formation according to published geological data. There is also likely to be made ground associated with former development. Environmental receptors identified comprise: • Groundwater within the deep geology of Thanet Sand and White Chalk, classified as a Principal Aquifer. • The nearest groundwater abstraction is 44m north at the Bernie Grant Arts Centre for potable water supply. • The site lies within Zone 2 of the groundwater Source Protection Zone (SPZ) for the public supply borehole located at Bernie Grant Arts Centre • The nearest identified surface watercourse to the site is the River Lea approximately 750 m to the south east of the site.
Site reconnaissance findings	No significant contaminative land uses identified. The whole site is covered by buildings and hardstanding.
Geotechnical constraints assessment	No significant geotechnical constraints identified. However, there are existing foundations and services on site. In addition, it is anticipated that made ground, associated with the previous site developments, is present.

Initial conceptual site model (CSM) and preliminary risk assessment (PRA)	The preliminary risk assessment confirmed the potentially complete contaminant linkages associated with the presence of the made ground on site as follows: • Current / future site users – educational facility users [oral, dermal and inhalation exposure with impacted soil, soil vapour and dust/fibres] • current adjacent site users – residential, commercial, public open space users [migration of contamination via dust/fibre deposition and inhalation] • new drinking water supply pipes [permeation of hydrocarbons into the drinking water pipes] •
INTRUSIVE INVESTIGATION & ASSESSMENT	
SI scope	Two hand excavated trial pits were dug to 1.20m bgl to investigate the existing foundations and one cable percussive boreholes was drilled to a maximum depth of 25.00m bgl to provide information on bearing capacities for piled foundations.
SI factual findings	The ground investigation encountered made ground within all the exploratory hole locations with a maximum thickness of 2.80m bgl and comprised a cohesive matrix with some anthropogenic materials. Beneath the made ground, the London Clay Formation was encountered to the base of the investigation at 25.00m bgl. A perched water was encountered within the made ground. Chrysotile asbestos fibres were identified by the chemical laboratory analysis within TP1 at 0.35m with an asbestos quantification weight of <0.001.
Refined conceptual site model and geo-environmental assessment	The results of the site investigation and GQRA indicate that asbestos found in Made Ground soils could present a risk to human health where exposure could occur. In conclusion, the geo-environmental assessment indicates that the made ground soils are suitable for the on-going use of the site as an educational facility, considering that the site will remain covered by buildings and hardstanding. However, the presence of asbestos fibres in the made ground should be considered during redevelopment works.
Geotechnical assessment	The key findings of the geotechnical assessment are as follows: • Piled foundations into the London Clay Formation can be considered for the proposed scheme; • The recommended sub-grade soil CBR value for road pavement design is 2%; and, • An ACEC Classification of AC-4 with a Design Sulphate Class of DS-4 can be utilised on the site.

**Recommendations
including issues for
further assessment**

The following recommendations are made for the site and proposed development:

- A details UXO risk assessment should be obtained to confirm the risk. The results of the UXO risk assessment should be carried over into contractors RAMS;
- The presence of asbestos fibres in the made ground should be addressed by appropriate working practices outlined in the contractors RAMS.

The information given in this summary is necessarily incomplete and is provided for initial briefing purposes only. The summary must not be used as a substitute for the full text of the report.

1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) was commissioned by Peter Marsh Consulting Ltd on behalf of Capital City College Group to carry out a Preliminary Risk Assessment and Geo-environmental and Geotechnical Assessment of the land at Tottenham Centre, The College of Haringey, High Rd, London, N15 4RU. The project was carried out to an agreed brief as set out in RSK's proposal (Ref. 1922791 T01 (01), dated 28/02/2023).

RSK's service constraints are shown in **Appendix A**.

The site in question is being considered for development for educational use.

1.2 Objectives

The objective of the work is:

- to identify any land contamination and geotechnical constraints to the proposed development
- to identify the need for any additional investigation or remediation works to demonstrate that the site is suitable for its proposed use
- to inform land asset management.

1.3 Scope of works

The scope of this assessment has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced through the report.

The assessment of the contamination status of the site is in line with the technical approach presented in Land Contamination Risk Management (LCRM) (Environment Agency, 2021) – which supersedes CLR11 Model Procedures for Land Contamination – and in general accordance with BS 10175: 2011 + A2 2017 (BSI, 2017). It is also compliant with relevant planning policy and guidance.

A brief summary of relevant legislation and policy relating to land contamination is given in **Appendix C**.

The scope of works, as specified by Peter Marsh Consulting Ltd, for the assessment has included the following:

Desk study:

- review of the history of development on the site and surroundings
- assessment of local geology, hydrogeology and hydrology
- review of relevant information held by appropriate statutory authorities
- review of any previous site investigation reports made available
- completion of a site reconnaissance survey to assess the visual condition of the site

- development of an initial conceptual site model (CSM)
- preliminary consideration of geotechnical constraints and hazards
- confirm access to the proposed site investigation locations.

Intrusive investigation

- design and implementation of an intrusive investigation, in situ testing, soil sampling, laboratory geo-environmental and geotechnical testing, groundwater and ground gas monitoring of installed boreholes
- interpretation of data to develop a refined conceptual site model (CSM)
- generic quantitative risk assessment (GQRA) of relevant contaminant linkages
- interpretation of ground conditions and geotechnical data to provide preliminary recommendations with respect to foundations and infrastructure design
- preliminary assessment of the potential waste classification
- preparation of this factual and/or interpretative report.

1.4 Existing reports

No existing reports relevant to the site assessment have been provided to RSK.

1.5 Limitations

This report is subject to the RSK service constraints given in **Appendix A** and limitations that may be described through this document.

2 SITE DETAILS

2.1 Site location

Site location details are presented in Table 1 and a site location plan is provided on Figure 1.

Table 1 Site location details

Site name	Tottenham Centre
Full site address and post code	High Road, Enfield, N15 4RU
National Grid reference (centre of site)	533598,189294

2.2 Site description

The Site boundary and current site layout are shown on **Figure 2**. The Site covers an area of c. 1.19 hectares. It is currently occupied by an active educational college facility. The site is an irregular shape and compromises the active college area to the West of the A10 road.

2.3 Surrounding land uses

The site is located in London, within a predominantly residential and commercial setting. Immediate surrounding land uses are described in Table 2.

Table 2 Surrounding land uses

North	Commercial buildings/offices, Tottenham Green
East	Commercial shops and residential property beyond
South	Residential Property
West	Residential Property

2.4 Development plans

The proposed layout of the site, at the time of preparing this report, is shown in **Appendix B**.

The development includes the construction of a new STEM building with a total GIA of around 3,200m². The project also includes the light refurbishment of around 850m² of space in the Centenary building to provide general purpose teaching/LRC and exams space to replace the other buildings being demolished. The proposed design (RIBA Stage 2) consists of a new 4-storey block (Figure 3-3), that will comprise of construction workshops (carpentry, joinery, fabrication and welding, heating and plumbing and electrical installation) along with science and ICT classrooms.

No details of the proposed ground levels have been provided therefore for the purpose of this report it has been assumed that the current levels will remain unchanged.

No active planning applications pertaining to the site were identified on the Haringey Council planning portal.

3 DESK-BASED ASSESSMENT

The desktop study was designed generally to meet the objectives of a preliminary (phase 1) investigation, as defined by BS 10175:2011 + A2 2017 (BSI, 2017) and this assessment relates to LCRM Stage 1, Tier 1 preliminary risk assessment. The "vicinity" of the site for the purposes of this report is defined as locations situated within an approximate 250m radius of the site, although certain sources and/ or sensitive targets further than 250m may also have been considered.

The study aims principally to identify and assess the potential risks and liabilities associated with contamination of the ground, on and in the vicinity of the site. While this includes consideration of current operations and housekeeping on the site, the report does not constitute a comprehensive environmental audit of the site, as covered under ISO 14001.

3.1 Site history

3.1.1 Historical development record

The development history of the site and surrounding area based upon assessment of historical plans and records is detailed in Table 3. The historical maps reviewed are shown within the environmental database report in **Appendix D**.

Table 3 Summary of historical development

Date from	Date to	Historical Land Use (on-site)	Area of site
1864	1896	Eaton House, Eagle House, Grove House, St. Ann's Chapel	All site
1896	1913	Eagle Avenue – residential properties (terraced housing) – North Grove house club - South	All site
1913	1955	Eagle Avenue – residential properties (terraced housing) Polytechnic - South	All site
1936	1955	Courthouse - south	All site
1955	Present	Tottenham Technical College – Tottenham College of Technology – The College of North East London – South	South
Date from	Date to	Historical Land Use (off-site)	Distance (m) and orientation
1864	1896	Residential Houses and associated woodland/orchards Trinity Church 100m North	

1896	Present	Railway running north/south	100m west
1896	1913	Tottenham lager beer brewery & ice factory	Directly south
1896	Present	Deaconesses' institution and hospital (1896) – General Hospital (1913) – Prince of Wales Hospital (1955) – Partially demolished with residential houses constructed to the East, changed to Prince of Wales community health centre (1991 to present)	110m East
1913	1987	Cold stores Associated above or below ground storage tanks – first labelled in 1955	Directly South East
1913	Present	Home for incurables – The Jewish home and hospital	Directly South
1913	2007	Municipal Buildings/Town Hall	Directly North
1913	2004	Public Baths	Directly North
1936	Present	School	100m North
1936	2004	Corporation Yard/council depot	50m North West
1936	1977	Shirt Factory	200m North East
1936	Present	Omnibus Depot/Tottenham garage	200m North
1955	1964	Fire station	Directly North
1964	1977	Ambulance station	Directly North
1991	Present	Tottenham green pools and fitness	100m North West

Relevant information sources: Historical OS maps ☒ Town plans ☐ Information from the Local Planning Authority ☐ Aerial photography ☒ Previous reports ☐

Note: Reference to published historical maps provides invaluable information regarding the land use history of the site, but historical evidence may be incomplete for the period pre-dating the first edition and between successive maps.

Potential historical contaminative land uses that may affect the site include made ground from historical developments on site. Offsite sources include the railway, which is still present 100m west of the site, the historic cold stores and associated above or below ground storage tanks, which bordered the site to the south west.

3.1.2 Unexploded ordnance

A review of publicly available unexploded ordnance (UXO) risk maps indicates that the site is located in an area with medium potential for wartime bombs to be present (Zetica, 2023).

3.2 Information from environmental database report

Relevant environmental permits and incidents detailed within the environmental database report (see **Appendix D**) are summarised below in Table 4.

Table 4 Summary of environmental permits, landfills and incidents

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Agency and hydrological				
Environmental permits – incorporating Integrated Pollution Prevention and Control, Integrated Pollution Controls, Local Authority Integrated Pollution Prevention and Control	0	0	14	252m SW - Perfect 'N' Clean Dry Cleaners 64 West Green Road, London, N15 5nr, PG6/46 Dry cleaning 347m W - Jeeves Of Belgravia, 30-48 Lawrence Road, London, N15 4eg, PG6/46 Dry cleaning 353m W - Crystal Dry Cleaners, 122a West Green Road, London, N15 5aa, PG6/46 Dry cleaning 371m SE - Tony'S Dry Cleaners, 97 Broad Lane, London, N15 4dw, PG6/46 Dry cleaning 403m NE - Hale Road Connect Service Station Hale Road, LONDON, N17 9JL, PG1/14 Petrol filling station, 17th April 2001

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Enforcement and prohibition notices	-	-	-	-
Pollution incidents to controlled waters, Prosecutions relating to controlled waters, Substantiated pollution incident register, Water Industry Act referrals	0	1	8	69m N - Tottenham Hale, Tottenham Environment Agency, Thames Region, Miscellaneous - Urban Runoff, Category 1 - Major Incident, 9th June 1996 761 SE - Markfield Road, Tottenham Environment Agency, Thames Region Oils - Unknown Confirmed As A Pollution Incident 24th February 1992, Category 3 - Minor Incident 819m SE - Tottenham Environment Agency, Thames Region Unknown Sewage Confirmed As A Pollution Incident 28th June 1995, Category 3 - Minor Incident 696m SE - Environment Agency - Thames Region, North East Area, 13th October 2003, Category 2 - Significant Incident, Other sewage

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Discharge consents	0	0	6	527m South - Marston Motor Auctions Sale of motor vehicles/ maintenance + repair - 158 High Road, Tottenham, London, Revoked - 1st October 1996- Discharge Of Other Matter-Surface Water into Freshwater Stream/River 656m South - Countryside Properties Plc, Undefined Or Other, Seven Sisters Road, Tottenham, London, N15, Revoked - 30th June 1991, Discharge Of Other Matter-Surface Water into Freshwater Stream/River
Registered radioactive substances	-	-	-	-
Landfill and waste				
Active landfills	-	-	-	-
Historic / closed landfills	-	-	-	-

Other waste management licences	0	0	14	678m SE - 82 Markfield Road, Tottenham, London, N15 4QF, Household, Commercial And Industrial Transfer Stations, issued - 7th November 1995 693m SE - Bridge Works, Markfield Road, Tottenham, London, N15 4QF, Mayer Parry Recycling Ltd Metal Recycling Sites (Mixed) Expired 22nd September 1992 - 16th September 1997 730m S - 6-40 Durnford Street, Tottenham, London, N15 5NQ Durnford Street Car Dismantlers & Breakers Limited, Vehicle Depollution Facility <5000 tps, 8th February 2015 655M SE - O' Donovan (Waste Disposal) Ltd, 82 Markfield Road, TOTTENHAM, London, N15 4QF, Waste transfer site, Large (Equal to or greater than 75,000 and less than 250,000 tonnes per year), No known restriction on source of waste, Operational as far as is known, 7th November 1995. Permitted wastes: Lwra Cat. A = Inert Wastes, Lwra Cat. Bi Gen.Non-Putresc, Lwra Cat. C 'Putresc' Some Prohibited wastes: Clinical - As In
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Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
				Coll/Disp.Reg. Of '88, Special Wastes, Waste N.O.S.
Potentially in-filled land (pit, quarry, pond, marsh, river, stream, dock etc)	0	2	10	731m SW - Unknown Filled Ground (Pit, quarry etc), Mapping date – 1990 100m S - Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Mapping date – 1876 135m SE - Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Mapping date – 1876 461m SE - Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Mapping date – 1876
Hazardous substances/ industrial land uses				
Control of Major Accident Hazards (COMAH) sites	-	-	-	-
Explosives sites, Notification of Installations Handling Hazardous Substances (NIHHS), Planning hazardous substance consents/ enforcements	-	-	-	-
Contaminated land Part 2A register entries and notices	-	-	-	-

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Contemporary trade directory entries	1	12	107	On site - All Thingz Nice, Town Hall Approach Rd, London, N15 4RX T-Shirts, Inactive 58m N - G W Commercial Cleaning Ltd Town Hall Approach Road, Tottenham, London, N15 4rx, Commercial Cleaning Services, Active 122m E - Tottenham Green Carpet Cleaners, Flat 1, Eliot Court, 2, Tynemouth Road, Tottenham, London, N15 4UD, Carpet, Curtain & Upholstery Cleaners, Active 268m SW - Omegahouse 74, West Green Road, Tottenham, London, N15 5ns, Printers, Active
Fuel station entries	-	-	1	364m SW - Smylies Garage, 105, Philip Lane , West Green , London, Inner London, N15 4JR, Obsolete
<i>Note: Entries have only been included within the table where they are located within a 250m radius of the site or, where they fall outside of this radius but are considered to comprise a significant entry.</i>				

3.2.1 Site services

Buried utility services and their backfill can provide preferential pathways for gas, vapour or groundwater to migrate along to another part of the site or to a receptor. They can also represent significant constraints to development.

Service plans obtained from utility companies either by RSK or the client are contained in **Appendix H**; these are dated 25/01/2023. Buried services present on-site or located

adjacent to site boundaries could represent a pathway for migration of groundwater and gases/ vapours.

3.3 Site geology

3.3.1 Anticipated geological sequence

Published records (British Geological Survey, 13.03.2023) for the area and available historical borehole logs indicate the geology of the site to be characterised by the succession recorded in Table 5. There are 29 publicly available BGS historical boreholes located on or within 250m of the site, a selection of which are presented in **Appendix E**.

Table 5 Site geology

Strata	Description	Estimated thickness	Permeability
Made ground	Brown Silty CLAY with Brick, Ash and gravel	~3m	Permeable
London Clay	Stiff brown grey silty sandy CLAY	~28m	Impermeable
Lambeth Group	Mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.	~16m	Permeable base layers
Thanet Sand	Typically composed of homogeneous, bioturbated, glauconitic silty fine-grained sand, with sandy silt, silt or sandy, silty clay especially in the lower part, forming a coarsening-upwards sequence.	10-15m	Permeable (Secondary A aquifer)
White Chalk	Chalk with flints. With discrete marl seams, nodular chalk, sponge-rich and flint seams throughout.	470-515	Permeable (Principal Aquifer)
Relevant information sources: BGS Geoindex ☒ BGS borehole logs ☒ Previous SI reports ☐			

With reference to the historical data there have clearly been several phases of construction and demolition on the site and therefore the presence of made ground should be expected.

3.3.2 Radon

The environmental database report indicates that the site is not located within an 'Affected Area'. An 'Affected Area' is one with 1% or more homes above the radon Action Level of 200 Bq m⁻³, and therefore the risk of significant ingress of radon into structures on-site is considered low and protection measures are not necessary in the construction of non-domestic buildings.

Although the radon data used in production of the ukradon indicative atlas comes from measurements in homes, the maps indicate the likely extent of the local radon hazard in all buildings.

3.4 Mining and quarrying

Evidence has been sought to identify any mining, quarrying, landfilling and land reclamation operations, past and present, which have taken place within 500m of the site. An initial site appraisal has been carried out based on the information provided on the Coal Authority Interactive Viewer of the UK Coalfield areas and the commercial environmental databased report for information on non-coal mining.

Use of the Coal Authority interactive viewer indicates the site lies outside their Coal Mining Reporting Area and therefore no further assessment of coal mining issues is required within this report.

3.5 Hydrogeology

A summary of the hydrogeological setting of the site, with respect to the anticipated geological sequence set out in Section 3.3 is presented below in Table 6.

Table 6 Summary of hydrogeological setting

Condition	Description
Aquifer characteristics	The site is underlain by unproductive strata relating to the London Clay Formation. The presence of low permeability clay at relatively shallow depths beneath the site, while restricting downwards migration, may increase the potential for lateral migration of shallow groundwater (and therefore mobile contamination, if present). A deep groundwater table, representing the aquifer sequence supported by the lower sections of the Lambeth Group, Thanet Sand and White Chalk, is present at a depth of around 40 mbgl.
Depth to groundwater and flow	The anticipated depth to the groundwater table is in the order of five meters below ground level estimated from BGS Hydrogeological Maps and BGS logs. Shallow groundwater in the site area is anticipated to flow in a South East direction, i.e. towards and in the direction of flow of the River Lea. It is also likely that shallow perched water may be present in any made ground deposits present on-site. The piezometric surface in the deeper aquifer is anticipated to be at approximately 40m bgl. The regional direction of groundwater flow is anticipated to be to the south east, in line with and toward the River Lea.

Condition	Description
	However, the groundwater flow direction may be affected by local groundwater abstractions located in the vicinity of the site.
Groundwater recharge/attenuation	Most of the site is currently covered with buildings and hardstanding and therefore this will limit infiltration to ground and groundwater recharge, except where SUDS are present.
Licensed groundwater abstractions	The environmental database report indicates that there are six current licensed groundwater abstractions of which one is a public water supply boreholes within a 1km radius of the site. The nearest groundwater abstraction is 44m north, at the Bernie Grant Arts Centre for potable water supply.
Source protection zones	Information available in the Envirocheck report and MAGIC website indicates that the site lies within Zone 2 of the groundwater Source Protection Zone (SPZ) for the public supply borehole located at Bernie Grant Arts Centre. Details of the SPZ designation are contained in Appendix E .

3.6 Hydrology

A summary of the hydrology within the site area is summarised in Table 7.

Table 7 Summary of hydrology in site area

Condition	Description
Surface watercourses/features	There are no ponds, streams or drainage ditches on or adjacent to the site. The nearest identified surface watercourse to the site is the River Lea located adjacent to the site/approximately 750 m to the south east. of the site.
Surface water abstractions	There are no surface water abstractions identified by the environmental database, within a 1 km radius of the site.
Site drainage	Surface drainage from the site appears to be discharged into on site drainage.
Preliminary flood risk assessment	The indicative floodplain map for the area, shows that the site lies within the designated floodplain of the River Lea. The risk of flooding each year has been assessed by the EA as low –i.e. this area has a chance of flooding of between 0.1% and 1% each year . A flood risk assessment (FRA) is outside the scope of this report.

3.7 Sensitive land uses

Table 8 provides a summary of any environmentally sensitive areas identified within 250m of the site based on the environmental database report and MAGIC Website.

Table 8 Environmentally sensitive areas

Feature	Present within 250m of site?	Details	Likely pathways from site?
International designations – Ramsar wetland, Special Area of Conservation (SAC), Special Protection Area (SPA)	No	n/a	n/a
National designations – Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), ancient woodland	No	n/a	n/a
Local designations – Local Nature Reserve, Site of Importance for Nature Conservation (SINC)	No	n/a	n/a
Nearest high sensitivity development, e.g. residential	Yes	Residential, South 50m	Yes – migration of contaminants in made ground through shallow groundwater

4 SITE RECONNAISSANCE FINDINGS

A site reconnaissance survey was completed on 21st March 2023 by RSK accompanied by a client representative. The characteristics of the site observed during the walkover and from current ordnance Survey maps are summarised in Table 9.

A site plan is provided in **Figure 2** with photographic records included in **Appendix F** detailing the main features identified below.

Whilst the walkover summary includes consideration of current operations and housekeeping on the site as potential sources of contamination, it does not constitute a comprehensive environmental audit of the site, as covered under ISO 14001.

Table 9 Site reconnaissance findings

Feature observed	Presence Y/N	Description
Physical characteristics		
1. Are there any access constraints?	Y	Fob operated gates to be opened by security
	-	b) Narrow entrances <3m
2. Is the site approximately level?	Y	The site is generally level. There is a ramp and retaining wall. The northern area is at a higher elevation than the rest of the site.
3. Any evidence of subsidence, landslip or slope erosion?	N	
4. Any changes in level between the site and adjacent sites?	Y	Ramps in the north of the site leading up to a higher site level.
5. Surface cover	Y	a) 100% hard surfacing
	-	
	-	
Environmental characteristics		
6. Vegetation on site	N	
7. Evidence for vegetation stress	N	
8. Invasive species	N	
	N	
	Y	
Site visit undertaken in dormancy period?	Y	
9. Surface water features	N	
	N	

Feature observed	Presence Y/N	Description
	-	
10. Site drainage	-	
	Y	Multiple surface water drains were present on site.
	-	
	-	
Structures and services		
11. Existing buildings on-site	Y	The Site contains a multi-storey tower block and a college building due to be demolished.
12. Buried and overhead services present	Y	Evidence of buried services, including covers, scars. Presence of a sub-station on site with survey markings.
13. Underground structures	Y	Foundations associated with current site buildings.
Geotechnical characteristics		
14. Evidence of damage to existing building structures on site?	N	
15. Remains of building structures present on or adjacent to site?	N	
16. Retaining walls and adjacent buildings on or close to site boundary?	Y	Retaining wall between adjacent properties to the north.
17. Any abrupt changes in ground level present on or adjacent to site?	Y	Northern area of the site approximately 2m higher than the rest of site.
18. Any potentially unstable slopes/ exposed ground present on or adjacent to site?	N	
19. Any mature trees on site?	N	
20. Any visual evidence of infilled basements on site?	N	
Potential evidence for contamination		

Feature observed	Presence Y/N	Description
21. Underground/ above ground storage tanks and pipework	N	
22. Potentially hazardous materials storage and use	N	
23. Waste storage	Y	Multiple waste skips with general waste.
24. Fly-tipping	N	
25. Electricity sub-stations/ transformers	Y	Substation present on site
26. Asbestos-containing materials	N	Asbestos could be present on site in discrete places. The review of asbestos registers for the existing buildings is not included in the scope of this report.
27. Fire suppression	Y	Sprinkler system inside buildings and fire extinguishers.
28. Fire history	N	
29. Is there any visual evidence of potential contamination on site?	N	
30. Is there any visual evidence of potential contamination on adjacent sites?	N	

No potentially significant land contamination or geotechnical issues were identified during the site reconnaissance survey.

5 PRELIMINARY GEOTECHNICAL CONSTRAINTS

5.1 Design class

BS EN 1997-1 defines three different Geotechnical Categories that structures may fall into, which are summarised as follows:

- Category 1: Small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations; with negligible risk
- Category 2: Conventional types of structure and foundation with no exceptional risk or difficult ground or loading conditions
- Category 3: Structures or part of structures, which fall outside limits of Geotechnical Categories 1 and 2. Examples include very large or unusual structures; structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions; structures in highly seismic areas; structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.

Based on the information provided above on the proposed development and in view of the anticipated ground conditions, a Geotechnical Category of Category 2 has been assumed for the purposes of designing the geotechnical investigation. This should be reviewed at all stages of the investigation and revised where necessary.

5.2 Preliminary geotechnical hazards assessment

A summary of commonly occurring geotechnical hazards associated with the anticipated geology outlined in Section 3.5 above is given in Table 10 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 5 Summary of preliminary geotechnical risks that may affect site

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	☒	☐	Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	☒	☐	Design to NHBC Standards Chapter 4 or similar

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Highly compressible and low bearing capacity soils, (including peat and soft clay)	☒	☐	Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	☒	☐	Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	☐	☒	Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)	☐	☒	May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence	☐	☒	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	☐	☒	Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	☐	☒	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	☐	☒	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	☐	☒	May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area	☐	☒	May affect deep foundations, basements and tunnels
Geological faults, fissures and breaklines	☐	☒	May affect ground engineering and foundation design and construction
Underground mining, including shafts and adits (e.g. coal, mineral)	☐	☒	Likely to require further assessment including potentially special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	☐	☒	Likely to affect ground engineering and foundation design and construction

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	☒	☐	Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	☒	☐	Likely to affect ground engineering and foundation design and construction vtr ☐
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	☒	☐	May affect ground engineering and foundation design and construction
Site topography	☐	☒	May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

6 INITIAL CONCEPTUAL SITE MODEL

In the UK land contamination is assessed using a risk-based approach taking account of the magnitude (severity of the hazard) and likelihood (probability) of occurrence. A 'receptor' is something that could be adversely affected by contamination (e.g. people, an ecological system, property or a water body). A 'pathway' is a route or means by which a receptor is or could be exposed to or affected by a contaminant. A 'contaminant source' is a hazard but it can only pose a risk to a receptor where a pathway is present. The relationship between sources, pathways and receptors are referred to as a conceptual site model. A risk can only be realised where a contaminant source, pathway and receptor are all in place, referred to as a 'pollutant linkage'.

In line with LCRM (Environment Agency, 2021) and BS 10175: 2011 + A2 2017 (BSI, 2017), RSK has used information in the preceding sections to identify hazards (sources of contaminants), receptors that may be impacted and plausible linking pathways. Where all three are present this is termed a potentially complete contaminant linkage and a qualitative risk estimation is made.

6.1 Potential soil, soil vapour and groundwater linkages

6.1.1 Potential sources of contamination

Potential sources of soil and groundwater contamination identified from current activities and the history of the site and surrounding area are presented in Table 11. Ground gas sources are addressed in the next section.

Table 6 Potential sources of soil and groundwater contamination

Potential sources	Contaminants of concern
On-site	
Made ground (i.e. fill material)	Unknown fill material but potentially including brick, ash and clinker and containing toxic and phytotoxic metals, inorganics, polycyclic aromatic hydrocarbons (PAHs), asbestos.
Off-site	
Historical storage tank and associated pipework	Petroleum hydrocarbons, solvents, chemicals.
Carpet, curtain and upholstery cleaning premises, 122m East	Chlorinated solvents.
Commercial Cleaning services 58m N	
Infilled former pits - 100m S, 135 SE, 461 SE	Inert/ commercial/ industrial/ municipal waste. Landfill leachate including ammoniacal nitrogen, chloride, inorganic and organic contaminants, PFAS and other POPs.

Potential sources	Contaminants of concern
Railway, 100m West of site	Petroleum hydrocarbons, toxic and phytotoxic metals, inorganics, PAHs, asbestos, herbicides

Offsite storage tanks could lead to the formation of LNAPL contamination, while chlorinated solvents from upholstery and commercial cleaning services may lead to the formation of DNAPL.

6.1.2 Sensitive receptors and linking exposure/ migration pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential sources identified above comprise:

- Current / future* site users – educational facility users [oral, dermal and inhalation exposure with impacted soil, soil vapour and dust/fibres, ingestion of home-grown produce, inhalation of vapours from groundwater and / or NAPL if present*]
- current adjacent site users – residential, commercial, public open space users* [migration of contamination via dust/fibre deposition, vapour or groundwater migration combined with inhalation*]
- current/ future* buildings and services [direct contact with contaminated soils or groundwater and chemical attack]
- groundwater in the deep Thanet Sand and Chalk aquifers and associated source protection zone 2 within bedrock deposits [percolation through permeable strata to aquifer/ lateral migration of dissolved phase/ NAPL etc.*]
- groundwater abstraction situated 44m north [lateral migration of dissolved phase/ NAPL etc.*]

Potential linking pathways are shown in brackets for each item above.

Please note that construction workers and future maintenance workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures according to the CDM Regulations.

Ecological receptors are only considered within the conceptual model in the context of statutory protected sites.

6.2 Potential ground gas linkages

6.2.1 Ground gas sources and gas generation potential

Potential ground gas sources identified for the site and surrounding are shown in Table 12.

Table 7 Potential ground gas sources

Potential sources	Indicative ground gas generation potential (CIEH, 2008)	Additional information
On-site		
Made ground with low degradable organic content (e.g. up to 5% organic material and no easily degradable waste).	Very low	
Off-site		
Infilled former pits - 100m S, 135 SE, 461 SE,	Low	

Given the anticipated ground conditions set out above, potential sources of ground gas generation have been identified associated with Made ground and historical infilled pits located in the vicinity of the site. The sources identified are indicated to have up to very low and low gas generation potential.

The site is not in a radon affected area with an estimated percentage of homes exceeding the action level of <1% as indicated on available radon potential mapping (UKHSA & BGS, 2022).

In accordance with BRE 211 guidance (2015) no protection measures are considered to be required in new developments.

6.2.2 Preferential pathways for ground gas migration

Credible preferential pathways potentially connecting the source and receptor through vertical and lateral migration are:

- geology of the made ground which is likely to be permeable
- building foundations, piled foundations and vibro-stone columns
- construction joints and cracks within building structure
- utility routes and service penetrations into buildings.

6.2.3 Sensitive receptors and linking pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential ground gas sources identified above comprise:

- current/ future site users – educational facility users [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation]
- current/ adjacent site users – residential users, commercial/ industrial workers* [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation]

- current/ future buildings and services [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion].

The assessment has identified receptors to include building structures and current/ proposed end-users.

Construction workers have not been identified as receptors for the purposes of this assessment. Risks may still be present to construction workers especially where works include the entry into excavations within the ground. Construction workers should undertake appropriate risk assessments and risks should be managed through health and safety procedures and the use of PPE.

6.3 Preliminary risk assessment

The preliminary risk assessment findings and potentially complete contaminant linkages are shown in Table 13 overleaf. The risk classification based on the combination of hazard consequence and probability using a risk matrix from CIRIA C552 (Rudland et al., 2001), a summary of which is included in **Appendix G**. This relates to Tier 1 preliminary risk assessment in LCRM (Environment Agency, 2021).

Table 8 Risk estimation for potentially complete contaminant linkages

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
Made ground (i.e. fill material)	Current/ future site users – educational facility users	Oral, dermal and inhalation exposure with impacted soil, soil vapour and dust Inhalation	Low likelihood	Medium	Moderate/Low	The contents of the made ground on site is unknown. Therefore, chemical testing and assessment of the made ground soils are required. It should be noted that the proposed development includes a new building and a hard cover, therefore direct oral, dermal and dust inhalation pathways will be mitigated by the design.
	Current adjacent site users – residential, commercial, public open space users	Migration of contamination via dust/fibre deposition	Low likelihood	Medium	Moderate/Low	The contents of the made ground on site is unknown. Therefore, chemical testing and assessment of the made ground soils site are required to confirm any potential risk associated with dust and fibres inhalation by of site users, specifically during the site redevelopment.
	Current/ future buildings and services	Direct contact with contaminated soils or groundwater and chemical attack permeation of hydrocarbons present in the made ground soils into a new water supply pipes	Low likelihood	Medium	Moderate to Low	Potable water services (plastic material) can be adversely affected by presence of hydrocarbons in ground.

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
	Groundwater and abstraction boreholes (SPZ 2) within bedrock deposits	Percolation through permeable strata to aquifer/ lateral migration of dissolved phase/ NAPL	Unlikely	Medium	Low	The permeability of the made ground beneath the site is unknown, however due to the presence of London Clay, migration of any shallow contamination to groundwater is unlikely. A foundations design of the new building should be reviewed in the piling risk assessment to inform any changes from the initial low risk rating.
Off Site Sources						
Historical underground / above ground storage tank and associated pipework Cleaning services, 58m N & 122m East Railway 100m east	Current/ future site users – educational facility users	Oral, dermal and inhalation exposure with impacted soil, soil vapour and dust Inhalation of vapours from groundwater and / or NAPL, if present	Unlikely	Medium	Low	Considering the presence of non-permeable clay at a shallow depth beneath the site, it is unlikely that volatile hydrocarbons would migrate to the site in concentrations that would represent a risk from volatilisation/migration and inhalation of hydrocarbon vapours.

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
Infilled former pits - 100m S, 135 SE, 461 SE	Current/ future site users – educational facility users and current future site buildings	Migration of round gases and leachates to the site	Unlikely	Medium	Low	Migration of gasses and leachates to the site via non-permeable London Clay is unlikely, resulting in the overall risk being low.

Risk matrix		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Potentially complete contaminant linkages with a potential risk of moderate to low or higher identified in Table 16 comprise:

- Current / future site users – educational facility users [oral, dermal and inhalation exposure with impacted soil, soil vapour and dust/fibres]
- current adjacent site users – residential, commercial, public open space users [migration of contamination via dust/fibre deposition and inhalation]
- new drinking water supply pipes [permeation of hydrocarbons into the drinking water pipes]

These potentially complete contaminant linkages need to be assessed further through appropriate site investigation to target the identified sources of potential contamination and assess the feasibility of identified pathways.

6.4 Data gaps and uncertainties

Key data gaps and uncertainties identified in the CSM at desk study stage include:

- gaps in available historical OS maps
- site was developed before first published OS map and prior history not known
- there are no previous investigations available for the site, therefore no information on actual concentrations of contaminants in soil at this stage

7 SITE INVESTIGATION STRATEGY & METHODOLOGY

7.1 Introduction

RSK carried out intrusive investigation works and subsequent monitoring of boreholes between April 2023 and May 2023.

7.2 Objectives

The specific objectives of the investigation were as follows:

- to establish the ground conditions underlying the site including the extent and thickness of any made ground
- to investigate specific potential sources of contamination identified in initial CSM
- to assess geotechnical properties of soils
- to address data gaps identified in Section 6.4
- to provide information on an initial waste soils classification.

The site investigation scope and objectives were set up by Peter Marsh Consulting Ltd.

7.3 Selection of investigation methods

The techniques adopted for the investigation were chosen with consideration of the objectives and site constraints, which are described below.

Cable percussion drilling was chosen based on the targeted drill depth, requirement for in-situ geotechnical data, the opportunity to collect both disturbed and undisturbed samples and install monitoring wells. This was supplemented by hand excavated trial pitting to investigate the shallow soils and existing building foundations in the footprint of the proposed new building.

Prior to conducting intrusive works, utility service plans were obtained and buried service clearance undertaken in line with RSK's health and safety procedures. Copies of statutory service records are contained in **Appendix H**.

7.4 Investigation strategy

The ground investigation was carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930:2015+A1:2020, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. Whilst every attempt was made to record full details of the strata encountered in the boreholes,

techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

The investigation comprised an exploratory investigation, with locations specified by the client focussing on the area of the proposed new teaching building.

The constraints to the investigation were as follows:

- Electric substation and corresponding electric cables in area of initial proposed foundation inspection pit.
- Services entering the building reducing the amount of potential locations to reposition the foundation inspection pit.

Prior to undertaking the hand excavated trial pits and cable percussion borehole it was necessary to break out the asphalt surface cover.

Details of the investigation locations, installations and rationale are presented in Table 14. Two hand excavated trial pits were dug to a maximum depth of 1.20m bgl before being backfilled with arisings. One cable percussive borehole was drilled to a maximum depth of 25.00m bgl and installed with a shallow gas monitoring well. An exploratory hole location plan is shown on **Figure 3**.

Table 9 Exploratory hole and monitoring well location rationale

Investigation type	Number	Designation	Monitoring well installation	Rationale examples below
Borehole by cable percussive methods	1	BH1	Gas / perched water	To prove the geological succession beneath the site and obtain geotechnical data.
Trial-pits excavated by hand	1	TP2	n/a	Foundation inspection pit to investigate extent of foundations of Tower Block building adjacent to proposed new building
Trial-pits excavated by hand	1	TP1	n/a	To prove the made ground and contamination status of the shallow soils within the footprint of the proposed new building

7.4.1 Implementation of investigation works

The site investigation works were carried out in general accordance with the UK Specification for Ground Investigation (UKSGI), third edition (AGS, 2022).

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930:2015+A1:2020 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1).

The monitoring well construction and associated response zones are detailed on the exploratory hole records in **Appendix I**. The response zones were installed to target identified gas generation sources detailed in the initial preliminary CSM.

The soil sampling and analysis strategy was designed to characterise each encountered soil strata, permit an assessment of the potential contaminant linkages identified and investigate the geotechnical characteristics. In addition, samples were taken to allow for geo-environmental and geotechnical testing to be undertaken.

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite required. They were dispatched to the laboratory in cool boxes under chain of custody documentation. Samples were stored in accordance with the RSK quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination.

7.5 Monitoring programme

7.5.1 Ground gas/ perched water monitoring

The initial CSM, indicates a low risk rating for potential ground gas generation and migration from the made ground on site and from offsite sources.

However, in order to confirm the low risk rating the borehole on site was constructed with a shallow ground gas / perched water monitoring installation pipe. The borehole installation was monitored on 12th May 2023 and the results, included in Appendix J indicate, that the borehole was flooded with perched water and therefore no ground gas monitoring was possible.

7.6 Laboratory testing

Laboratory testing was undertaken at a UKAS accredited laboratory with ISO17025 and MCERTS accredited test methods were specified where applicable for contamination testing and as shown in the laboratory test certificates appended.

7.6.1 Chemical analysis of soil samples

The programme of chemical tests undertaken on soil samples obtained from the intrusive investigation is presented in Table 15 with the laboratory testing results contained in **Appendix K**.

Table 10 Summary of chemical testing of soil samples

Stratum	Tests undertaken	No. of tests
Made ground	Asbestos screening and ID	2
	Asbestos quantification	1
	Metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn)	2
	Speciated 16 PAH	3
	TPH CWG banding with aliphatic / aromatic splits	2
	pH, total sulphate, water soluble sulphate	2
	Hexavalent chromium (Cr V1)	1
	Total organic carbon	1
	Volatile organic compounds	1

7.6.2 Geotechnical analysis of soils

Where appropriate disturbed, bulk and undisturbed soil samples were taken for geotechnical classification testing with the depth and nature of samples detailed within the exploratory hole records.

Where appropriate, testing was undertaken in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes or, where superseded, by the relevant part of BS EN ISO 17892:2014 Geotechnical investigation and testing - Laboratory Testing of Soil. Tests carried out in order to classify the concrete class required on-site have been undertaken following the procedures within BRE SD1:2005.

The programme of geotechnical tests undertaken on samples obtained from the intrusive investigation is presented in Table 16. The results and UKAS accreditation of tests methods are shown in **Appendix L**.

Table 16 Summary of geotechnical testing undertaken

Strata	Tests undertaken	No. of tests
Made Ground	BRE SD1 brownfield pyritic ground	4
London Clay Formation	Moisture content %	8
	Liquid/ plastic limits	8
	Triaxial single stage	6
	BRE SD1 brownfield pyritic ground	4

8 SITE INVESTIGATION FACTUAL FINDINGS

The results of the intrusive investigation and subsequent geo-environmental and geotechnical laboratory analysis undertaken are detailed below.

8.1 Ground conditions encountered

The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater, in-situ testing and details of monitoring well installations are included on the exploratory hole records presented in **Appendix I**.

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over the London Clay Formation. This appears to confirm the stratigraphical succession described within the preliminary CSM.

For the purpose of discussion, the ground conditions encountered during the fieldworks are summarised in Table 17 with the strata discussed in subsequent subsections.

Table 17 General succession of strata encountered

Stratum	Exploratory holes encountered	Depth to top of stratum m bgl	Proven thickness (m)
Made ground	All	GL	1.20* – 2.80
London Clay Formation	BH1	2.80	22.20**
Note *thickness not proven in TP1 & TP2, ** thickness not proven			

8.1.1 Made ground

The made ground generally comprised a cohesive matrix with a high granular content and where proven a thickness of 2.80m bgl was encountered. Anthropogenic materials observed within the made ground comprised brick, asphalt, concrete and ceramic.

A summary of the in-situ and laboratory test results recorded in the stratum are presented in Table 18.

Table 18 Summary of in-situ and laboratory test results for made ground

Soil parameters	Min. Value	Max. Value	Reference
SPT 'N' values	6	8	Appendix I
Undrained shear strength measured by shear vane testing (kN/m ²)	42	80	

8.1.2 London Clay Formation

This stratum was encountered below the made ground in BH1 and comprised an initially firm brown silty clay with occasional pockets of sand becoming a stiff dark grey clay with selenite crystals at depth.

A summary of the in-situ and laboratory test results recorded in the stratum are presented in Table 19.

Table 19 Summary of in-situ and laboratory test results for London Clay Formation

Soil parameters	Min. Value	Max. Value	Reference
Moisture content (%)	22	28.6	Appendix L
Modified moisture content (%)	22	29	
Liquid limit (%)	50	70	
Plasticity limit (%)	24	31	
Plasticity index (%)	22	40	
Modified plasticity index (%)	21.78	40	
Plasticity term	High	Very high	
Volume change potential	Medium	High	
SPT 'N' values	9	44	Appendix I
Undrained shear strength inferred from SPT 'N' values (kN/m ²)*	40	198	-
Undrained shear strength measured by triaxial testing (kN/m ²)	63	226	Appendix L
Consistency term from field description	Firm	Stiff	Appendix I
Notes: *derived using a Stroud Factor of 4.5			

8.2 Groundwater (perched water)

8.2.1 Groundwater (perched water) encountered during intrusive works

A perched water seepage was encountered at the interface between the Made Ground and London Clay Formation in BH1 at 3.00 m bgl. Perched water was also encountered within TP1 at 0.85 m bgl.

8.3 Foundation Inspection Pits

Two foundation inspection pits (TP1 – TP2) were undertaken to establish the foundations of the existing foundations. Details of the foundations and founding stratum are included in the exploratory logs in **Appendix I** and in **Figures 4a & 4b**.

8.4 Chemical laboratory results

The soil and groundwater testing results are presented in **Appendix K**.

8.5 Geotechnical laboratory results

The results of the geotechnical testing are discussed in Section 11 and presented in **Appendix L**.

9 GEO-ENVIRONMENTAL ASSESSMENT

9.1 Refinement of initial CSM

The ground investigation did not identify the presence of unexpected sources of contamination. Ground conditions with respect to land contamination were identified to be as anticipated in the preliminary CSM in Section 6.

9.2 Linkages for assessment

As described in LCRM (Environment Agency, 2021a), there are two stages of quantitative risk assessment (QRA), Tier 2 generic (GQRA) and Tier 3 detailed (DQRA). The GQRA comprises the comparison of soil, groundwater, soil gas and / or ground gas results with generic assessment criteria (GAC) that are appropriate to the linkage being assessed. This comparison can be undertaken directly against the laboratory results or following statistical analysis depending upon the sampling procedure that was adopted. This assessment relates to LCRM Stage 1, Tier 2 generic quantitative risk assessment

Following the refinement of the CSM, the potentially complete contaminant linkages that require further assessment and the methodology of assessment are presented in Table 20.

Table 20 Linkages for GQRA

Potentially relevant contaminant linkage	Assessment method
Human health and phytotoxic-related linkages	
H1. Oral, dermal and inhalation exposure of the future occupiers / site users to impacted soil, soil vapour and dust.	Human health GAC in Appendix M for a proposed educational (secondary) end use. The assessment is considered conservative, as the direct exposure pathways (oral and dermal) will be mitigated by the proposed building and hardstanding, with no areas of soft landscaping.
H2. Inhalation exposure of neighbouring residents to dust and asbestos fibres, specifically during construction works.	Qualitative assessment based on the asbestos minerals present, their form, concentration, location and the nature of the proposed development.
H3. Organic contaminants permeating potable water supply pipes	Comparison of soil data to GAC in Appendix N for plastic water supply pipes using UKWIR (2010) guidance.

9.3 Methodology and assessment of human health

9.3.1 H1. Oral, dermal and inhalation exposure with impacted soil by future occupants/site users

All soil results have been directly compared against the GAC for secondary school end use with a soil organic matter (SOM) of 1% being selected. The soil screening results are detailed within **Appendix O**.

The soil analytical screening of samples collected by RSK indicates that no samples exceeded their respective GAC.

9.3.2 H2. Inhalation exposure of neighbouring residents / college users to asbestos fibres (specifically during construction works)

The laboratory screening for asbestos identified detectable asbestos fibres within the made ground in TP2 at 0.35m bgl. This sample was then further analysed and the presence of fibres of chrysotile were confirmed, with a maximum of <0.001 % by weight present.

The presence of asbestos in one out of the two samples tested indicates Made Ground is likely to pose an unacceptable risk to human health and therefore appropriate measures should be adopted by the contractors on site during site's redevelopment.

The exposure of future site users to asbestos detected in the made ground will be mitigated by the proposed buildings and hardstanding.

9.3.3 H4. Organic contaminants permeating potable water supply pipes

For initial assessment purposes, the results of the investigation have been compared with the GAC presented in **Appendix N** for this linkage, which are reproduced from *UKWIR Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (UKWIR, 2010).

The results indicate that a relevant linkage is unlikely to exist associated with organic contaminants and therefore pollutant polyethylene (PE) and/or polyvinyl chloride (PVC) water supply pipes are expected to be suitable for use on the development.

It should be noted that at the time of this investigation the future routes of water supply pipes had not been established, hence the investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

Alternatively, barrier pipes should be used where new drinking water supply pipes are constructed in the made ground.

9.4 Uncertainties and implications in refined CSM and GQRA

In accordance with good practice, data gaps and uncertainties in the refined CSM have been identified at this stage. These are summarised in Table 21 along with the likely implications.

Table 21 Data gaps and uncertainties

Data gap/ uncertainty	Details	Implications
The full extent of made ground has not been established throughout the footprint of the proposed new building	Made ground was encountered to the termination depth in TP1 and TP2.	An absence of information to support the geotechnical design.
The presence of asbestos fibres was detected in the soils, but no obvious ACM were observed and noted during the site works.	Although not encountered to date, asbestos containing material (ACM) could still be present in discrete locations	Vigilance should be maintained for any potential ACM or fibrous material during below ground works.
The shallow installation pipe was flooded with perched water.	No ground gas monitoring was carried out to confirm a low risk rating associated with generation and migration of ground gases, as the borehole screen was flooded.	It is likely that localised dewatering of excavations would be required during construction works over wet weather periods. Based on the made ground descriptions, it is unlikely that the made ground encountered on site would have a high ground gas generation potential and therefore the risk from ground gases remains low.

10 PRELIMINARY WASTE ASSESSMENT

In accordance with the definition provided in the Waste Framework Directive (WFD), materials are only considered waste if ‘they are discarded, intended to be discarded or required to be discarded, by the holder’. Naturally occurring soils are not considered waste if reused on the site of origin for the purposes of development. Soils such as made ground that are not of clean and natural origin (irrespective of whether they are contaminated or not) and other materials such as recycled aggregate, do not become waste until the criteria above are met. Further background information is provided in **Appendix G**.

Excavation arisings from the development may therefore be classified as waste if surplus to requirements or unsuitable for reuse. The following assessments assume the material tested is classified subsequently as waste (after reuse options have been excluded).

10.1 Hazardous waste assessment

Technical Guidance WM3, Appendix D (Environment Agency, 2022b) sets out requirements for waste sampling. It is a legal requirement to correctly assess and classify waste. The level of sampling should be proportionate to the volume of waste and its heterogeneity. The preliminary assessment provided below is based only upon the available sample results and may not be sufficient to adequately classify the waste.

10.1.1 Chemical contaminants

EnviroLab, an RSK company, has developed a waste soils characterisation assessment tool (HASWASTE), which follows the guidance within Technical Guidance WM3. The analytical results have been assessed using this tool to assess the hazardous properties to support potential off-site disposal of materials in the future. Note that it is ultimately for landfills to confirm what wastes they are able to accept within the constraints of their permit.

No samples were found to have hazardous properties based on this assessment. This suggests that if applicable the waste would require disposal at a suitably permitted inert or non-hazardous waste landfill.

10.1.2 Asbestos within waste soils

Technical Guidance WM3 requires that within a mixed waste the separately identifiable wastes be assessed separately.

For instance, where waste soil contains identifiable pieces of asbestos (visible to the naked eye) the asbestos should, where feasible, be separated from the soil and classified separately. This should be disposed of within a hazardous, stable non-reactive hazardous waste landfill or a special cell in a non-hazardous waste landfill.

Samples of potential asbestos containing material were collected from site and analysed for the presence of asbestos, the results of which are presented in **Appendix K**. Analysis confirmed that asbestos is present within sample TP2 at 0.35m.

Sample TP2 at 0.35m have been analysed for percentage asbestos fibres by weight, the results of which are presented in **Appendix K**. Analysis confirmed that percentage of asbestos fibres is less than 0.1% by weight and therefore the waste can be disposed of within a non-hazardous waste landfill, which is able to accept asbestos at non-hazardous concentrations.

11 GEOTECHNICAL ASSESSMENT

11.1 Proposed development

It is understood that the development includes the construction of a new 4 storey STEM building

At this stage no specific information relating to building loads has been provided and therefore column loads of up to 1000 kN have been considered along with a ground floor loading of 30 kN/m².

11.2 Key geotechnical hazards / development constraints

The key risks identified from the available ground investigation data are discussed below:

- ***Shrinkable clay soils.***

The investigation encountered cohesive London Clay Formation, with medium to high volume change potential.

- ***Silt-rich soils susceptible to rapid loss of strength in wet conditions.***

The cohesive portion of the London Clay Formation with silt content generally variable.

- ***Adverse ground chemistry***

The London Clay Formation was encountered at depth beneath the site and elevated sulphates is anticipated within this stratum. Therefore, consideration is required for chemical attack on buried concrete structures.

- ***Sudden lateral changes in ground conditions***

The investigation encountered varying depths of made ground.

- ***Filled and made ground***

The investigation encountered a significant thickness of made ground across the site between 1.20 m to 2.80 m bgl.

11.3 Foundations

11.3.1 Foundation options

Given the significant depth of made ground encountered across the site it is considered that spread footings are unlikely to be suitable for the development unless some form of ground improvement such as vibro-replacement or vibro-compaction is agreed feasible. If such ground improvement is not considered technically appropriate/cost-effective (by specialist contractors/structural engineers/building control etc) then pile foundations taken into the underlying competent strata are recommended.

11.3.2 Piled foundations

Recommendations for the design and construction of pile foundations in relation to the ground conditions are set out in Table 22 .

Table 22 Design and construction of piled foundations

Design/construction considerations	Design/construction recommendations	
Pile type	The construction of both bored and driven piles is considered technically feasible at this site.	
Possible constraints on choice of pile type	Given the close proximity of the site to a residential area it is considered possible that the vibration/noise associated with pile driving may not be acceptable.	
Man-made obstructions	The presence of buried sub-structures or other obstructions within made ground may lead to some difficulty during piling. It is recommended that once the proposed pile layout has been determined, pre-pile probing be carried out at each of the pile positions. Where buried obstructions are encountered, it will be necessary to either relocate the pile(s) or make allowance for removing the obstruction.	
Hard strata	An allowance should be made for chiselling thin 'rock' bands (claystone, limestone or cemented sandstone) within the London Clay Formation.	
Pile design parameters for cohesive deposits	Undrained shear strength c_u (kN/m ²)	81
	Adhesion factor α	0.5
	Limiting shaft friction (kN/m ²)	110
General parameters	Limiting concrete stress (kN/m ²)	7.5 N/mm ²
	Factor on ultimate shaft friction	1.2
	Global margin of safety	3.0
Special precautions relating to bored pile shafts and bases	Bored pile concrete should be cast as soon after completion of boring as possible and in any event the same day as boring. Prior to casting the base of the pile bore should be clean, otherwise a reduced safe working load will be required. Similarly, if the pile bore is left open the shaft walls may relax/soften, leading to a reduced safe working load.	

The design procedure for piles varies considerably, depending on the proposed type of pile. However, for illustrative purposes Table 23 gives likely working pile loads for traditional bored, cast-in-situ concrete piles of various diameters and lengths, based on

the design parameters as given in Table 22. For this purpose, the soil profile in BH1 has been considered.

Table 23 Illustration of typical pile working loads for bored cast-in-situ piles

Typical pile working loads (kN)				
Depth of pile below existing ground level (m)	Pile diameter			
	350 mm	450 mm	600 mm	750 mm
15.00	333	447	632	836
17.50	422	563	791	1039
20.00	519	690	964	1261
22.50	625	828	1153	1501
25.00	722	977	1355	1760

It should be stressed that the above capacities do not take into consideration pile group effects, which is more pronounced for a large number of closely spaced piles.

Notwithstanding the above, it is recommended that the detailed advice of a specialist-piling contractor be sought as to the most suitable type of pile for the prevailing ground conditions and as to their lengths and diameters to support the required design loads.

11.3.3 Foundation works risk assessment

It is anticipated that a foundation works risk assessment report will not be required for the development because:

- a considerable thickness of cohesive London Clay Formation stratum has been encountered beneath the site (average thickness of 22m) is likely to significantly retard migration pathways and the foundation proposed will not affect this
- there are no identified ground gas sources present at depth that could be affected by the type of foundation proposed

However, should piles be proposed to be constructed to a greater depth than 25 mbgl, a deeper boreholes would be required to confirm the design and the requirement for a piling works risk assessment.

11.3.4 Floor slabs

The site is generally underlain by more than 600mm of existing made ground. Therefore, ground-bearing floor slabs would not be appropriate and suspended floor slabs should be used.

11.4 Roads and hardstanding

In the 1m to 1.5m below the proposed finished ground level the exploratory holes have revealed a soil profile comprising made ground overlying the London Clay Formation.

In pavement design terms, the groundwater conditions are anticipated to comprise a low water table, i.e. within 300mm of/between 300mm and 1000mm of/at least 1m below the pavement formation level.

The estimated minimum, equilibrium soil-suction, California bearing ratio (CBR) value for the soils and groundwater conditions described above under a completed pavement is 2 %, based upon Table C1 in TRRL (1984) Report LR1132.

The sub-grade condition at the time of construction should be confirmed by testing at the final formation level by in situ CBR testing.

The sub-grade soils can be regarded as frost-susceptible, based upon the criteria given in Appendix 1 of TRRL (1970) Report Road Note 29. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450 mm.

11.5 Excavations for foundations and services

Generally, the trial pits remained stable during excavation which indicates that foundation excavations should also remain stable in the short term. In the event that excavations are to remain open for longer periods, consideration should be given to the use of trench support systems.

Man entry into any excavations should not be undertaken without provision of suitable shoring and support and dewatering or suitable regrading and battering of side slopes to safe angles. Confined spaces protocols for the Health and Safety of personnel should always be used where man entry into excavations is to be undertaken as low oxygen conditions may be present.

11.6 Chemical attack on buried concrete

This assessment of the potential for chemical attack on buried concrete at the site is based on BRE Special Digest 1: Concrete in aggressive ground, which represents the most up-to-date guidance on this topic currently available in the UK.

The desk study and site reconnaissance indicate that, for the purposes of assessing the aggressive chemical environment of the site, the site should be considered as comprising brownfield ground likely to contain pyrite.

Based on testing results, Table 24 gives the characteristic pH, water-soluble and total sulphate content values for soils from each of the geological units and groundwater encountered on-site.

Table 24 Characteristic pH, water soluble sulphate and total sulphate values

Stratum	pH	Water Soluble Sulphate (mg/l)	Total Potential Sulphate (mg/l)
Made ground	7.83 – 8.17	<10 - 24	<30 - 720
London Clay	8.05 – 8.24	587 – 1,100	1,761 – 3,300

Based on the results above and following the steps outlined in the BRE guidance, the Design Sulphate Classes and Aggressive Chemical Environment for Concrete classifications are summarised in Table 25, on the basis of water soluble sulphate and total potential sulphate, respectively.

Table 25 Concrete design class

Stratum	Ground water	Water Soluble Sulphate		Total Potential Sulphate	
		DS Class	AC Class	DS Class	AC Class
Made Ground	Mobile	DS-1	AC-1	DS-3	AC-3
London Clay Formation	Mobile	DS-2	AC-2	DS-4	AC-4

Assuming that disturbed ground will be minimised by the use of piled foundations, the recommended ACEC Classification is therefore AC-4 with a Design Sulphate Class of DS-4.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Geo-environmental assessment

The preliminary risk assessment confirmed a potential presence of contamination impacted made ground on site. In addition, a number of potentially contaminative activities / sources was identified in the vicinity of the site. However, considering the presence of London Clay Formation at shallow depth, it was concluded in the preliminary conceptual site model, that migration of contamination (including impacted groundwater and ground gases / vapours) to the site from offsite sources is unlikely.

The preliminary risk assessment confirmed the potentially complete contaminant linkages associated with the presence of the made ground on site as follows:

- Current / future site users – educational facility users [oral, dermal and inhalation exposure with impacted soil, soil vapour and dust/fibres]
- current adjacent site users – residential, commercial, public open space users [migration of contamination via dust/fibre deposition and inhalation]
- new drinking water supply pipes [permeation of hydrocarbons into the drinking water pipes]

The key findings of the follow on geo-environmental site assessment are as follows:

- The ground conditions confirm the presence of made ground over the London Clay Formation. The made ground, proven to a depth of 2.8 mbgl, generally comprised a cohesive matrix with brick, asphalt, concrete and ceramic. A groundwater was noted to be present in the made ground, perched on the top of the London Clay.
- Asbestos chrysotile fibres were detected in one sample of Made Ground soil at concentrations <0.001 % by weight.
- The results of chemical testing confirmed that all contaminants remained below the adopted screening criteria.

In conclusion, the geo-environmental assessment indicates that the made ground soils are suitable for the on-going use of the site as an educational facility, considering that the site will remain covered by buildings and hardstanding. However, the presence of asbestos fibres in the made ground should be considered during redevelopment works.

The initial waste classification indicates that the made ground waste soils, generated during construction works, should be disposed of into a non-hazardous landfill, accepting waste with traces of asbestos at non-hazardous concentrations.

12.2 Geotechnical assessment

The key findings of the geotechnical assessment are as follows:

- Piled foundations into the London Clay Formation can be considered for the proposed scheme;
- The recommended sub-grade soil CBR value for road pavement design is 2%; and,
- An ACEC Classification of AC-4 with a Design Sulphate Class of DS-4 can be utilised on the site.

12.3 Recommendations

The following recommendations are made for the site and proposed development:

- A details UXO risk assessment should be obtained to confirm the risk. The results of the UXO risk assessment should be carried over into contractors RAMS;
- The presence of asbestos fibres in the made ground should be addressed by appropriate working practices outlined in the contractors RAMS.

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FIGURES

FIGURE 1 SITE LOCATION PLAN



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Client
Capital City College Group

Project Name
Tottenham Centre

Description
Site Location Plan

Dimension	Size	Scale	Geolocation	Project ID	Drawing no.	Rev	File name
m	A4	1:25,000	533598,189294	1922791	11101	C01	1922791-HH-111-SS-D-C-11101-C01

FIGURE 2 SITE LAYOUT PLAN



LEGEND

— Site boundary

Notes:

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C01	16.03.23	First Issue	AS	MJ	MJ
Rev	Date	Amendment	Drawn	Chkd	Appd



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Client Capital City College Group		
Project Name Tottenham Centre		
Description Site Layout Plan		
Project ID 1922791	Drawing no. 11201	Revision C01
File name 1922791-HH-112-SS-D-C-11201-C01		
Dimensions m	Scale 11201	Size A3

FIGURE 3 EXPLORATORY HOLE LOCATION PLAN



Exploratory Hole Location Plan

Client: Capital City College Group

Figure No: 3

Site: Tottenham Centre

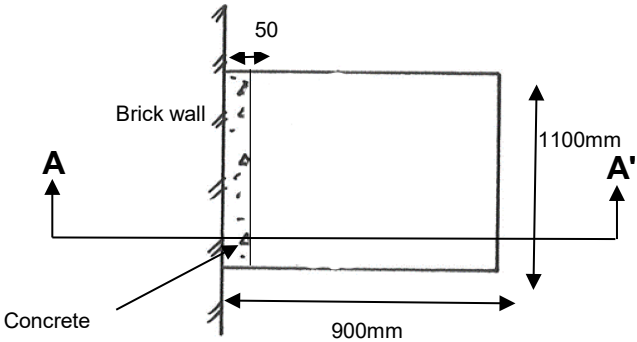
Job No: 1922791

Scale: NTS

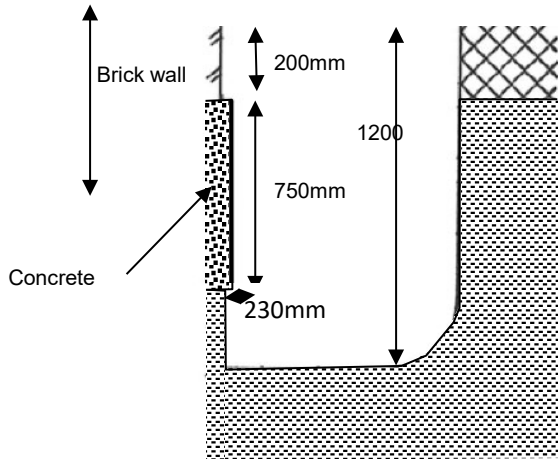
Source: Client

FIGURE 4 FOUNDATION INSPECTION PIT DRAWINGS

PLAN



SECTION A - A'



0.0 to 0.20m - ASPHALT

0.0 to 0.40m - MADE GROUND (Brown black sandy slightly clayey fine to coarse angular to subangular GRAVEL of brick, asphalt, concrete and flint with brick cobbles. Sand is fine to coarse.

0.4 to 0.75m - MADE GROUND (Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick, asphalt, concrete, ceramic, flint.)

0.75 to 1.20m - MADE GROUND (Brown orange grey mottles slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick, concrete and flint.)

PHOTOS



General Remarks				
Foundation protrudes only 0.23m from the wall edge				
RSK Environment Ltd 18 Frogmore Road Hemel Hempstead Hertfordshire HP3 9RT United Kingdom		Tel: +44 (0)1442 437500 Fax: +44 (0)1442 437550		Drawing Title TP2
Dimensions mm		Level (mAOD) -	Scale NTS	Project Title Tottenham Centre
Client Capital City College Group			Project Number 1922791	

APPENDICES

APPENDIX A SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Capital City College Group (the "Client") in accordance with the terms of a contract [RSK Environment Standard Terms and Conditions] between RSK and the Client, dated 28th February 2023. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas, persistent, bioaccumulative or toxic chemicals (including PFAS and related compounds) or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.

- b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.
- c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

- 8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.
- 9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
- 10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.
- 11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.
- 12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

APPENDIX B DEVELOPMENT PLANS
