



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

Proposed Conversion of Bowling Green and Clubhouse to single residential unit

on the site of

**Glencairn Bowls Club,
Blake Road, Southgate, London
N11 2AF**

Date: July 2021

Status:

Final Report

Reference:

3067D P1V2 Lousada PLC

Date:

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EXECUTIVE SUMMARY

The site is currently occupied by a disused bowling green and clubhouse.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** to **MODERATE** level of risk with respect to the proposed development.

It is recommended that further environmental investigation be planned and implemented.

It is recommended that the Buildings on site should be subject to an asbestos survey and removal by appropriately qualified personal prior to any redevelopment occurring in order to ensure site works do not cause future contamination of the site.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken

A watching brief (as outlined in Appendix D) should be had during the course of demolition, site clearance and construction works for any obvious contamination (e.g. oil spillage in ground, buried waste, possible asbestos containing material) development should stop and Castledine Environmental should be contacted to determine if further assessment or changes to the remediation scheme are required.

CONTENTS

<u>1.0</u>	<u>QUALITY ASSURANCE</u>	<u>1</u>
<u>2.0</u>	<u>LIMITATIONS</u>	<u>1</u>
<u>3.0</u>	<u>INTRODUCTION</u>	<u>2</u>
<u>4.0</u>	<u>SCOPE</u>	<u>2</u>
<u>5.0</u>	<u>SITE DESCRIPTION</u>	<u>3</u>
<u>6.0</u>	<u>REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA</u>	<u>4</u>
6.1	HYDROLOGICAL	4
6.1.1	AQUIFER	4
6.1.2	ABSTRACTIONS AND PRIVATE WATER SUPPLIES	5
6.1.3	SOURCE PROTECTION ZONE	5
6.1.4	GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL	5
6.1.5	POTENTIAL SURFACE WATER	5
6.1.6	DISCHARGE CONSENTS	5
6.2	PERMITTED PROCESSES	5
6.3	POLLUTION INCIDENTS	5
6.4	RADIOACTIVE SUBSTANCES REGISTRATIONS	5
6.5	WASTE	6
6.5.1	LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)	6
6.5.2	LANDFILL SITES	6
6.6	HAZARDOUS SUBSTANCES	6
6.7	ECOLOGICAL RECEPTORS	6
6.8	SOILS AND GEOLOGY	6
6.8.1	SUPERFICIAL DEPOSITS	6
6.8.2	BEDROCK	6
6.8.3	ARTIFICIAL GROUND	7
6.8.4	COAL MINING	7
6.8.5	RADON	7
6.9	AERIAL PHOTOGRAPHY	7
6.9.1	BING	7
6.9.2	GOOGLE MAPS	7
6.9.3	GOOGLE EARTH	7
6.9.4	ENVIRONMENTAL SEARCH	10
6.10	GOOGLE STREET VIEW	11
6.11	HISTORIC MAPPING	11
6.12	CURRENT LAND USE DATA	12
6.13	PETROL AND FUEL SITES	13
6.14	HISTORICAL PETROL AND FUEL SITE DATABASE	13

6.15	POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING	13
6.16	HISTORICAL TANK DATABASE	15
6.17	HISTORICAL ENERGY FACILITIES	15
<u>7.0</u>	<u>POLLUTANT LINKAGE ASSESSMENT</u>	<u>15</u>
7.1	SOURCES	16
	7.1.1 ONSITE	16
	7.1.2 OFFSITE	16
7.2	PATHWAYS	16
7.3	RECEPTORS	17
<u>8.0</u>	<u>CONCEPTUAL SITE MODEL</u>	<u>17</u>
8.1	PRELIMINARY CONCEPTUAL SITE MODEL	17
	8.1.1 SOIL CONTAMINATION	17
	8.1.2 HAZARDOUS GROUND GAS AND VAPOURS	18
<u>9.0</u>	<u>ENVIRONMENTAL RISK ASSESSMENT</u>	<u>21</u>
<u>10.0</u>	<u>SUMMARY OF RISKS</u>	<u>22</u>
	10.1.1 SOIL CONTAMINATION	22
	10.1.2 GROUND GASSES AND VAPOURS	22
<u>11.0</u>	<u>FURTHER ENVIRONMENTAL INVESTIGATION</u>	<u>22</u>
<u>12.0</u>	<u>REFERENCES</u>	<u>23</u>
12.1	LEGISLATION AND REGULATIONS	23
	12.1.1 ACTS	23
	12.1.2 PLANNING REGULATIONS	23
	12.1.3 CONTAMINATED LAND REGULATIONS	23
12.2	STATUTORY GUIDANCE	23
12.3	BRITISH STANDARDS	24
12.4	NON STATUTORY TECHNICAL GUIDANCE	24
	12.4.1 ENVIRONMENT AGENCY	24
	12.4.2 CIRIA PUBLICATIONS	24
	12.4.3 CL:AIRE	24
<u>13.0</u>	<u>APPENDICES</u>	<u>25</u>

LIST OF APPENDICES

APPENDIX A	ENVIRONMENTAL SEARCH	26
APPENDIX B	PROPOSED AND CURRENT SITE PLANS	27
APPENDIX C	SITE PHOTOS AND LOCATIONS	28
APPENDIX D	WATCHING BRIEF	33
APPENDIX E	DISCOVERY STRATEGY	35

LIST OF TABLES

TABLE 1.	SUMMARY OF SIGNIFICANT POLLUTION LINKAGES	19
TABLE 2.	RISK CLASSIFICATION MATRIX	20
TABLE 3.	CLASSIFICATION OF RISK	21

1.0 QUALITY ASSURANCE

Castledine Environmental confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental

Kevin Castledine

(Proprietor)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental have been appointed by Lousada PLC to undertake a Phase 1 Desk study on land at Glencairn Bowls Club, Blake Road, Southgate, London N11 2AF.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Lousada PLC and their appointees for the purpose of ensuring compliance with:

- paragraph 170, 178, & 179 of the National Planning Policy Framework 2018,
- part C1 of the building regulations.

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental

The report consists of a preliminary risk assessment in accordance with BS10175:2011+A2:2017 and CLR11 "Model Procedures for the Management of Land Contamination".

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Southgate, in the Haringey Borough of London at National Grid Reference: 5229370,191478 and is approximately 0.35ha in area.

The site is rectangular in shape orientated north west to south east and connected to Blake Road via an access spur. The site is directly bounded by a school to the north west and north, residential dwellings to the north east, east and south east and a wooded area to the south west. The wooded area lies atop a railway tunnel orientated north west to south east and parallel with the south western site boundary. The surrounding areas are predominantly residential with a golf course located to the west/south west and an industrial area located beyond the school and housing to the north.

The site interior comprises a bowling green club house, an office or amenity structure and the bowling green itself.

The clubhouse is located parallel with the south eastern boundary of site. It was seen be constructed of brick and wood and roofed with slate. Access to the interior was unavailable on the day of the site walkover. A rusted metal pipe with a yellow gas main within was noted extending south west from the site access to the club house. The area of ground between the site access and the club house was noted to be waterlogged and boggy underfoot. A redundant water main was also noted in this area. The area between the rear of the clubhouse and the south eastern boundary was noted to be heavily vegetated. A second rusted pipe of unknown usage was noted running along the south eastern boundary of site.

A second, adjoined building was noted in the southernmost corner of site, again surrounded by dense vegetation.

The remainder of site is occupied by the former bowling green itself. This area was seen to be less densely vegetated with areas of furrowed ground

or minor depressions. These are assumed to be animal burrows which have collapsed.

No potential sources of contamination were noted on the site walkover. Topographically the site sits on two levels, the lowermost bowling green level and the higher clubhouse. The entire site sits just below the adjacent residential gardens to the south east.

Photos of the site are present in Appendix C

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed.

The most pertinent information is summarised in the following sections.

A copy is presented in Appendix A

Additional geological and hydrological data was obtained from the British Geological Survey.

6.1 HYDROLOGICAL

6.1.1 AQUIFER

6.1.1.1 SUPERFICIAL GEOLOGY

The Groundsure report records no superficial aquifer underlying site.

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

The Groundsure report records no potable, surface or groundwater abstraction licences within 250m of site.

6.1.3 SOURCE PROTECTION ZONE

The site is not in a source protection zone.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

ID	location	Summary	Soil / Surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Unproductive aquifer (may have productive aquifer beneath) Combined classification: Unproductive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records a surface level watercourse located 66m, 67m and 83m south west of site and a small pond or lake located 219m east of site.

6.1.6 DISCHARGE CONSENTS

None recorded within 250m of site.

6.2 PERMITTED PROCESSES

None recorded within 250m of site.

6.3 POLLUTION INCIDENTS

None recorded within 250m of site.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 250m of site.

6.5 WASTE**6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)**

None recorded within 250m of site.

6.5.2 LANDFILL SITES

None recorded within 250m of site.

6.6 HAZARDOUS SUBSTANCES

None recorded within 250m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the site as being directly within the Lee Nitrate Vulnerable Zone (surface waters). A Local Nature Reserve (LNR) is recorded 982m south of site and named Alexandra Palace and Park, no further ecological receptors are recorded within 1000m of site.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

6.8.1 SUPERFICIAL DEPOSITS

The Groundsure report records no superficial deposits on or within 250m of site.

6.8.2 BEDROCK

The Groundsure report record bedrock geology of the Thames Group underlying site, comprising clay, silt, sand and gravel.

BGS Geoindex mapping – which is more specific – records the London Clay Formation underlying site. This formation comprises a bioturbated, poorly laminated blue-grey or grey-brown, slightly calcareous silty to very silty clay, clayey silt and sometimes silty with layers of sandy clay.

6.8.3 ARTIFICIAL GROUND

BGS Geoindex mapping records artificial deposits of worked ground (undivided) and describe as a void located approximately 200m south east and 170m north west of site.

6.8.4 COAL MINING

The site is not in a coal mining reporting area.

6.8.5 RADON

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary as described in publication BR211:2015 by the Building Research Establishment.

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following

6.9.1 BING

The site is shown as occupied by the clubhouse and bowling green in the same layout and orientation as that seen on the day of the site walkover. The green area appears to be overgrown at this time.

6.9.2 GOOGLE MAPS

The site is shown as occupied by the clubhouse and bowling green in the same layout and orientation as that seen on the day of the site walkover. The green area appears to be overgrown at this time.

6.9.3 GOOGLE EARTH

13 No. images are held in the historic imagery dataset, as follows:

Date	Description
December 1945	Imagery is indistinct. However, the site is shown as occupied by the clubhouse and bowling green as seen in the present-day. The site surroundings roughly resemble the present day with open green space (possibly a golf course as in the present-day) to the west and some industry beyond housing to the north. There may be an additional 2 No. greens located immediately north and north west of site (see image below)
	
September 1999	Site is now clearly shown as occupied by the clubhouse and bowling green. The school directly north has been constructed at this time. The industrial area to the north has seen some extension (see image below).
	

Date	Description
December 2003	No major change on site, however, cars can be seen parked in the eastern most corner of site, adjacent to the site access and between this and the clubhouse.
July 2005	No major or discernible change on site.
September 2005	No major or discernible change on site.
September 2006	No major or discernible change on site.
December 2006	A small structure or outbuilding can be made out in the far western corner of site.
June 2010	No major or discernible change on site.
July 2013	The site now appears disused as the state of the bowling green has declined into a rougher vegetated state. Fencing can be seen boarding up the site access and no cars are parked on site. The building in the far west of site has been overgrown slightly (see image below).
	
June 2015	The site is now shown as much more overgrown than previously.
April 2017	No major or discernible change on site. Site remains disused.
May 2018	The eastern area of site appears to have been scraped of vegetation and had some paving and material removed. A spoil pile can be seen adjacent to the site access and on the green itself and the green has seen some material removed. This leaves approximately a third of the green appearing bare of vegetation (see image below).

Date	Description
	
June 2019	The formerly scraped and cleared areas on site (eastern extent and south eastern third of the green) are now once again overgrown and vegetated, however these areas can still be distinguished somewhat.

6.9.4 ENVIRONMENTAL SEARCH

Date	Description
04/09/1999	The site is shown as occupied by the clubhouse and bowling green in the same layout and orientation as that seen on the day of the site walkover. The site appears in use at this time as the green and the site in general appear to be in a good state of repair.
28/04/2013	No major change to site layout or structures. However, the site now appears to be disused with the green appearing rough with vegetation and in a state of disrepair.
12/08/2016	No major change on site.
22/08/2019	No major change to site layout or structures. The outline of former excavations can be seen on site. They are located in the southern eastern third of the green and the far eastern extent of site and identified from previous satellite imagery (referenced above).

6.10 GOOGLE STREET VIEW

The main site body cannot be viewed from Google Street View. Only the site access track off Blake Road can be seen, with a number of parked cars noted associated with the nearby school.

6.11 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment. Castledine Environmental do not hold a license for the reproduction and/or distribution of these maps.

Map	Onsite	Offsite
OS County Series: Middlesex, 1873-1881, 1:10,560	The site is shown as unoccupied agricultural field.	The surrounding areas are predominantly agricultural field. The railway tunnel running just outside and parallel with the south western boundary of site is present at this time. A brickworks with a pit is located approx. 180m south east of site.
OS County Series: Middlesex, 1879-1883, 1:10,560	No discernible change on site.	The brickworks has seen some extension south west with additional pits, ponds and machinery (crushers and washers).
OS County Series: Middlesex, 1896-1897, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: Middlesex, 1912-1914, 1:2,500	No discernible change on site.	The brick pit to the south east has seen further extension and addition of pits. A new earth working is located approx. 140m north west of site 3 No. ponds are located approx. 100m and 220m east and 120m north of site.
OS County Series: London (partial), 1920, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: Middlesex (partial), 1935-1936, 1:2,500	The site has now been developed into the bowling green and the clubhouse with a pavilion.	The surrounding areas have been heavily urbanised with the addition of a large amount of terraced housing. Three tennis courts have been constructed immediately north with a court located immediately north west of site. The ponds previously noted north and east of site have been removed as part of this development. The brickworks to the south east is removed but the earth workings remain.

Map	Onsite	Offsite
OS Plan, 1951-1962, 1:10,560	No discernible change on site.	The former brick pits to the south east have now been developed into Scout Park.
OS Plan, 1967-1973, 1:1,250	No discernible change on site.	Surrounding areas have seen further urbanisation and development of housing. The three tennis courts located directly north of site have been removed, leaving an open area. An engineering works, down quilt factory and warehouse and a large bottle factory with further smaller works beyond are now located approx. 130m north west and 200m north of site.
OS Plan, 1973-1975, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
OS Plan, 1981-1983, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
Russian Map: London, 1985, 1:25,000	No discernible change on site.	The final tennis court has been removed and the school seen north of site in the present-day has now been constructed.
OS Plan, 1989-1992, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.

6.12 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
1	47	SW	Electricity Substation	Electrical features	Infrastructure and facilities
2	118	NW	Mast	Telecommunications features	Infrastructure and facilities
A	187	NW	The Grading Bureau	Special purpose machinery and equipment	Industrial products
A	188	NW	Roma Marble	General construction and supplies	Industrial products
A	193	NW	Chimney	Chimneys	Industrial features
A	207	NW	Warehouse	Container and storage	Transport, storage and delivery
A	211	N	Electricity Substation	Electrical features	Infrastructure and facilities
A	212	N	Works	Unspecified works or factories	Industrial features
A	213	NW	Gradeline	Textiles, fabrics, silk and machinery	Industrial products

ID	Distance [m]	Direction	Company	Activity	Category
A	213	NW	Lord Clothing	Clothing, components and accessories	Consumer products
3	216	N	Electricity Substation	Electrical features	Infrastructure and facilities
A	222	NW	Praxis	Signs	Industrial products
A	224	N	Langham Lifts Ltd	Industrial repairs and servicing	Repair and servicing
A	231	N	Soundtech Europe Ltd	Electrical components	Industrial products
A	232	NW	J O'Connor Ltd	Mechanical engineers	Engineering services
A	233	N	Electricity Substation	Electrical features	Infrastructure and facilities
4	239	N	Electricity Substation	Electrical features	Infrastructure and facilities
A	240	NW	Seltex	Wood products including charcoal, paper, card and board	Industrial products
A	246	NW	Storage Services Ltd	Container and Storage	Transport, storage and delivery
A	246	NW	Chelsea Air Conditioning Ltd	Construction completion services	Construction services

6.13 PETROL AND FUEL SITES

The Groundsure report records no current or recent petrol sites located within 250m of site.

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
A	0	On site	Tunnels	1962-1987
A	0	On site	Tunnels	1951
A	0	On site	Tunnels	1894
A	4	SW	Tunnels	1938

ID	Distance [m]	Direction	Use	Date
A	7	SW	Tunnels	1920
A	14	SW	Tunnels	1911
A	17	SW	Tunnels	1879
A	17	SW	Tunnels	1869
A	32	SW	Tunnels	1911
B	101	NW	Unspecified commercial/industrial	1973-1980
C	106	NW	Cuttings	1920
C	107	NW	Railway sidings	1938
C	107	NW	Cuttings	1879
C	107	NW	Cuttings	1869
D	108	NW	Railway sidings	1951
C	109	NW	Railway buildings	1894
B	109	NW	Unspecified commercial/industrial	1987
C	109	NW	Cuttings	1962
B	110	NW	Unspecified works	1962
C	111	NW	Cuttings	1951
E	113	SE	Pottery	1938
C	113	NW	Cuttings	1894
B	1116	NW	Bottle works	1938
C	118	NW	Cuttings	1911
E	124	E	Pottery	1920
C	1244	NW	Railway sidings	1920
F	129	SE	Pottery	1911
B	130	NW	Unspecified factory	1962
F	130	SE	Pottery	1864
C	132	NW	Cuttings	1938
B	132	NW	Unspecified pit	1894
B	132	NW	Unspecified pit	1911
B	134	NW	Unspecified pit	1920
2	134	SE	Pottery	1911
F	137	SE	Brick works	1869
F	137	SE	Brick works	1879
E	160	E	Unspecified ground workings	1951
E	161	E	Unspecified ground workings	1962
B	170	N	Bottle works	1938
E	174	E	Unspecified ground workings	1911
E	178	E	Unspecified pit	1894
F	178	SE	Unspecified heap	1894
F	179	SE	Unspecified ground workings	1920
F	180	SE	Unspecified ground workings	1951

ID	Distance [m]	Direction	Use	Date
E	182	E	Unspecified ground workings	1920
C	186	NW	Railway building	1920
D	191	NW	Railway sidings	1864
B	191	NW	Unspecified tank	1962
E	195	E	Unspecified tank	1920
G	197	NW	Unspecified works	1962
G	197	NW	Sewage works	1951
B	198	N	Unspecified works	1962
F	207	SE	Unspecified pit	1879
F	207	SE	Unspecified pit	1869
E	208	E	Unspecified ground workings	1912
E	222	E	Unspecified ground workings	1894
D	234	NW	Unspecified works	1987

6.16 HISTORICAL TANK DATABASE

ID	Distance(m)	Direction	Use	Date
F	190	SE	Unspecified tank	1896-1913
E	191	E	Tanks	1896
E	194	E	Unspecified tank	1913
B	243	NW	Unspecified tank	1967-1969

6.17 HISTORICAL ENERGY FACILITIES

ID	Distance(m)	Direction	Use	Date
1	43	SW	Electricity substation	1973
H	199	N	Electricity substation	1950-1992
D	220	N	Electricity substation	1979-1990

7.0 POLLUTANT LINKAGE ASSESSMENT

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential on and off site sources, pathways and receptors in the context of the proposed

development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Made ground from construction/demolition onsite and nearby
- Parked vehicles in the eastern corner of site
- Unknown medium used for bowling green construction

7.1.2 OFFSITE

- Made ground (voids 200m south east and 170m north west)
- Backfilled ponds
- Railway cutting

7.2 PATHWAYS

A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion;
- Skin contact;
- Inhalation;
- Plant uptake,
- Direct contact by buried structures;
- Leaching of soluble contamination into groundwater

7.3 RECEPTORS

Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

- Human Health
 - Current users of the site;
 - Future users of the site;
 - Users of neighbouring sites;
 - Construction workers; and
 - Services personnel working in trenches.
 - Construction Materials
- Buried concrete, which may be affected by high concentrations of sulphate and/or low pH, in the soils and groundwater underlying the site; and
- Buried water pipes.
- Controlled Waters
- Ecological Receptors
- Flora and fauna using the proposed development

8.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist. It creates a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and proposed end use of the site.

8.1 PRELIMINARY CONCEPTUAL SITE MODEL

8.1.1 SOIL CONTAMINATION

The site is currently occupied by a disused bowling green and clubhouse. Whilst unlikely to be significantly contaminated, historic practices both on-site and nearby have the potential to have contaminated the site with various substances including

- Metals and metalloids;
- Petroleum hydrocarbons
- Asbestos

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

No significant sources of ground gas or vapour have been identified on or nearby site. There are several backfilled ponds and brick pits within 250m of site, however, the site is located in an area of the London Clay Formation. The clay composition of the bedrock and superficial deposits in this area would inhibit ground gas migration.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils	Direct Ingestion & Direct Contact	Site Workers	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons
Contaminated Soils	Inhalation of Dust	Site Workers	Li	Md	M	
Contaminated Soils	Direct Ingestion & Direct Contact	End Users	Li	Md	M	Due to the sensitive proposed end usage of the site, it is recommended that the site be tested for a standard suite of contaminants.
Contaminated Soils	Inhalation of Dust	End Users	Li	Md	M	
Contaminated Soils	Direct Ingestion	Flora and Fauna	Li	Md	M	
Contaminated Soils	Vertical and lateral migration	Controlled Waters	UI	Md	L	
Contaminated Soils	Direct contact	Services	UI	Md	L	
Ground Gases (Methane and CO ₂)	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	No significant sources of ground gas or vapour have been identified on or nearby site. The clay composition of the bedrock and superficial deposits in the area would inhibit ground gas migration.
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
 Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
 Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2. RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3. CLASSIFICATION OF RISK

Very high risk (Vh)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (Hi)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (Lw)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (VI)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** to **MODERATE** level of risk with respect to the proposed development.

It is recommended that further environmental investigation be planned and implemented.

It is recommended that the Buildings on site should be subject to an asbestos survey and removal by appropriately qualified personal prior to any redevelopment occurring in order to ensure site works do not cause future contamination of the site.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken.

10.0 SUMMARY OF RISKS**10.1.1 SOIL CONTAMINATION**

Whilst the site is unlikely to be significantly contaminated. It is recommended that further investigation of the site soils be carried out. This is due to the potential presence of made ground deposits from the construction of the bowling green and clubhouse; made ground deposits from construction of surrounding residential areas (and the school to the north); identified movements of machinery in the south eastern third of the green and eastern corner of site; storage of parked vehicles over time in the eastern corner of site; high levels of natural lead and arsenic in the London Clay Formation; the unknown medium used to construct the bowling green itself (potentially contaminated deposits originating from elsewhere/London Clay Formation); and the sensitive end usage of the proposed development.

10.1.2 GROUND GASSES AND VAPOURS

No significant sources of ground gas or vapour have been identified on or nearby site. There are several backfilled ponds and brick pits within 250m of site, however, the site is located in an area of the London Clay Formation. The clay composition of the bedrock and superficial deposits in this area would inhibit ground gas migration

11.0 FURTHER ENVIRONMENTAL INVESTIGATION

It is recommended that a Phase 2 Intrusive Site Investigation be planned and implemented. This would involve the formation of trial pits to facilitate the taking of environmental samples for laboratory analysis.

12.0 REFERENCES**12.1 LEGISLATION AND REGULATIONS****12.1.1 ACTS**

- [1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

12.1.2 PLANNING REGULATIONS

- [2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

12.1.3 CONTAMINATED LAND REGULATIONS

- [4] The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

12.2 STATUTORY GUIDANCE

- [7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8] Communities and local Government, 2018: National Planning Policy Framework.

12.3 BRITISH STANDARDS

- [9] BS 5930:2015 Code of practice for site investigations
- [10] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice
- [11] BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- [12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

12.4 NON STATUTORY TECHNICAL GUIDANCE**12.4.1 ENVIRONMENT AGENCY**

- [13] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

12.4.2 CIRIA PUBLICATIONS

- [14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association
- [15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

12.4.3 CL:AIRE

- [16] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17.* CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

13.0 APPENDICES

APPENDIX A

ENVIRONMENTAL SEARCH

PROPOSED SITE PLANS



APPENDIX C

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

Photo No.1: Site access track off Blake Road, facing SE



Address: Glencairns Bowling Club, Southgate, London
Client: Lousada PLC

Photo No.2: Site access off track, facing SW





Site Walkover Photos

Photo No.3: Bowling clubhouse from site access, facing SW



Address: Glencairns Bowling Club, Southgate, London

Client: Lousada PLC

Photo No.4: Site and bowling green area from eastern corner of site, facing west toward western corner





Site Walkover Photos

Address: Glencairns Bowling Club, Southgate, London
Client: Lousada PLC

Photo No.5: Boggy area noted immediately south of access



Photo No.6: Gas main seen entering building from site access





Site Walkover Photos

Photo No.7: Clubhouse pavilion, facing NE



Address: Glencairns Bowling Club, Southgate, London
Client: Lousada PLC

Photo No.8: Site from southern corner and clubhouse, facing north toward northern corner across bowling green





Site Walkover Photos

Photo No.9: Clubhouse from NW boundary, facing SE



Address: Glencairns Bowling Club, Southgate, London

Client: Lousada PLC

**Photo No.10: Bowling green from northern corner of site,
facing south west toward western corner of site**



APPENDIX D**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

APPENDIX E

DISCOVERY STRATEGY

