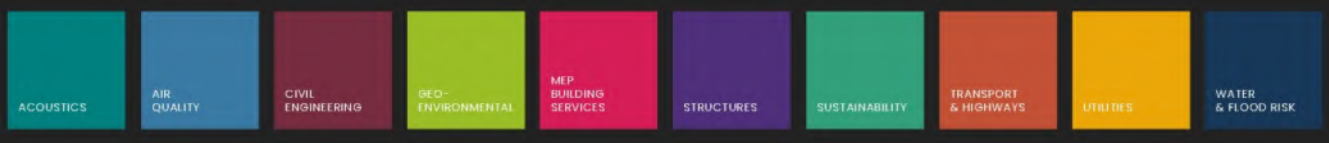
Denville Hall Development Limited

DENVILLE HALL, 62 DUCKS HILL ROAD, LONDON

Demolition and Construction Management Plan (DMP/CMP)



Independent, multidisciplinary engineering and environmental consultants

Norwich | London | Chelmsford | Glasgow | Milton Keynes

visit us at **createce.co.uk** or call us on **01603 877010**

APPENDIX E
Site Investigation Report

Soil Consultants
Ground Investigation
Geotechnical Analysis
Contamination Assessment

SITE INVESTIGATION REPORT

PROPOSED REDEVELOPMENT:

DENVILLE HALL, 62 DUCKS HILL ROAD, NORTHWOOD, HILLINGDON HA6 2SB

Client:	**DENVILLE HALL 2012 LTD** **62 Duck's Hill Road** **Hillingdon** **HA6 2SB**
Consulting Engineers:	**LONDON STRUCTURES LAB** **48a Union Street** **London SE1 1TD**
Report ref:	**10767/JW**
Date:	**27th October 2022**

SITE INVESTIGATION REPORT

PROPOSED REDEVELOPMENT:

DENVILLE HALL, 62 DUCKS HILL ROAD, NORTHWOOD, HILLINGDON HA6 2SB

DOCUMENT ISSUE STATUS:

Issue	Date	Description	Author	Checked/approved
Rev 0	27/10/22	First issue	James Williams MSc, BEng (Hons), FGS	Stuart Wagstaff BSc(Hons), MSc, FGS, CGeol, RoGEP

This investigation has been undertaken within the constraints of the client's instruction/contract, together with those set out in the 'General information, limitations and exceptions' section at the end of this report. The SCL 'Standard Terms of Appointment' are also included at the end of this report and these identify the contractual arrangements for the investigation. Conclusions or recommendations made in this report are limited to those which can be reasonably based upon the research and/or intrusive investigation work carried out. Any comments which rely on third-party information which has been provided to us are made in good faith and on the assumption that such information is accurate. SCL have not carried out independent validation of any third-party information.

Soil Consultants Ltd (SCL) has prepared this Report for the Client in accordance with the Terms of Appointment under which our services were performed. With respect to third parties, no other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and express written agreement of SCL.

TABLE OF CONTENTS

General Information, Limitations and Exceptions
Standard Terms of Appointment

APPENDIX A

Fieldwork, in-situ testing and monitoring

- Foreword
- Rotary auger borehole records
- Dynamic sampler borehole records
- Standard Penetration Test results
- SPT hammer calibration certificates
- Trial pit records
- Shallow sample summary
- Groundwater and gas monitoring results

Laboratory testing

- Index property testing
- Plasticity chart
- Unconsolidated undrained triaxial test results (QUT)
- Particle size distribution tests

Ground profiles

- Plot of SPT 'N' value and undrained cohesion versus level
- Cross section through boreholes

Contamination and chemical testing

- Foreword
- General soil suite
- PCB congeners suite
- WAC test results
- Sulphate/pH suite

Plans, drawings & photographs

- Site photographs
- Site survey drawing
- Tree Constraints Plan (GHA Trees Arboricultural Consultancy drawing Rev A, dated June 2021)
- Proposed development plans and sections
- Site Plan
- Location Plan

APPENDIX B

- GroundSure historical maps (Ref SCL-8995153)
- GroundSure Enviro+GeoInsight Report (Ref SCL-8995154)

1.0 INTRODUCTION

Consideration is being given to the redevelopment of parts of this site, including the demolition of a number of derelict buildings and the construction of several new two to three-storey buildings, one of which will incorporate a single level basement. In connection with the proposed works, Soil Consultants Ltd (SCL) were commissioned by Change Project Consulting Ltd, on behalf of the client, Denville Hall 2012 Ltd, to carry out a site investigation to include the following elements:

- Stage 1 Tier 1 Preliminary Risk Assessment (Desk Study) including initial Conceptual Site Model (CSM)
- Intrusive investigation to identify the ground sequence and groundwater conditions
- Geotechnical and geo-environmental sampling and laboratory testing
- Provision of advice on foundations, retaining walls, ground floor slabs and the feasibility of the use of soakaways
- Stage 1 Tier 2 generic quantitative risk assessment and refined Conceptual Site Model (CSM)

This report includes a summary of the findings and conclusions of the Desk Study research and Preliminary Risk Assessment. It then describes the intrusive investigation undertaken, gives a summary of the ground conditions encountered and discusses various foundation options. The Stage 1 Tier 2 generic environmental appraisal is then provided, including a revised CSM.

2.0 SITE DESCRIPTION

A summary description of the site and its general setting is as follows:

Site location and setting	↓ Located on the western side of Duck's Hill Road, within the London Borough of Hillingdon ↓ NGR 508140E 191350N
Site dimensions	↓ The site is irregular in shape, measuring approximately 125 (N-S) x 110m (E-W) across its centre
Site boundaries	↓ Duck's Hill Road to the east with woodland and residential properties beyond. Open fields to the west and residential properties/gardens to the north and south
Site description	↓ The site comprises the grounds of Denville Hall care home ↓ The southern part of the site is occupied by the main building/facilities (Photo 1), which comprises a 16th Century house (rebuilt c.1850) which has been subsequently extended/redeveloped including a substantial two-storey extension c.2004. Access is via an asphalt driveway, flanked by tended grass areas, which leads to two discrete parking areas to the north of the main building. A large, tended lawn is present to the north-east of the main building which is bordered by an asphalt pathway on all sides (Photo 6) ↓ The northern and eastern parts of the site are occupied two smaller, detached, derelict residential buildings, comprising a two-storey apartment block (Photo 7) and bungalow (Photo 2). Both buildings were set within grassed areas bordered by mature trees/vegetation ↓ A bin/waste storage area is present at the northern end of the car park (Photo 4) and a small detached refrigeration/food storage unit is present adjacent to the main residential block (Photo 5) ↓ A single-track drive connects the northern part of the site with Duck's Hill Road to the northeast
Topography and site levels	↓ Topographical drawing supplied (Milton Keynes Surveys, Ref: 41975_1, dated July 2022) indicates the wider site to slope down to the south/south-east, from a maximum elevation of about +74.20mOD within the northern extent to a minimum of about +68.00mOD adjacent to the site's junction with Duck's Hill Road, at an overall slope angle of about three degrees ↓ Ground floor level of the main building is between about +71.30m and +71.50mOD
Existing vegetation within site and adjacent properties	↓ Numerous mature broadleaf and coniferous tree species are present within the site and on its boundaries. A tree survey (GHS Trees Arboricultural and Planning Integration Report, Ref GHA/DS/122660:21) indicates the presence of high water demand trees including oak and cypress, and moderate water demand species including sycamore, ash, pine and wellingtonia

The current site features are shown on the Site Plan and Site Photographs which are included in Appendix A.

3.0 STAGE 1 TIER 1 PRELIMINARY RISK ASSESSMENT (DESK STUDY)

This assessment is generally based upon current UK guidance, primarily the Environment Agency's "Land contamination: risk management" 2020. The scope of the assessment is as follows:

- A review of historical and current land–use and potential contaminated land risks
- Development of an outline conceptual model, identifying potential sources, pathways and receptors
- Development of a strategy for intrusive investigation

3.1 Review of historical mapping

The following summary of the history of the site and surrounding area has been compiled from a series of historical maps (Groundsure Ref: SCL-8995153, 19/08/22) obtained from a commercially available database; these are included in Appendix B.

Historical development of site and surrounding area		
Map date	**The site**	**Significant development / features in surrounding area**
1864/1900	The site is occupied by a single, substantial, property identified as Northwood Hall, part of which comprises a glass/greenhouse. Further large glass/greenhouses are present to the west The remainder of the site comprises deciduous and broadleaf woodland	The immediate surrounding area generally comprises woodland to the west and a mixture of woodland and furze/pasture to the east A road/track is present along the south-eastern boundary Three buildings with nearby wells about 102m E Several ponds are present between 20m and 241m E/SE. Also present 131m NW Marsh land about 100m E which appears to have been landscaped
1911/1920	A rectangular area is present within the centre of the site, bordered by a break of slope, (which roughly corresponds with the location of the contemporary lawn) indicating possible re-grading of the area	Several detached properties between 60m and 173m NE A number of cuttings are shown within the area to the east formerly shown as woodland and furze/pasture

Historical development of site and surrounding area		
Map date	**The site**	**Significant development / features in surrounding area**
1932/1965	The site is identified as Denville Hall Home for Aged Actors and Actresses Glass/greenhouses formerly within the western part no longer no longer present Two large detached buildings, and several smaller ancillary buildings/structures, present within the northern and eastern parts of the site	Residential development immediately north and south of site, and fronting Duck's Hill Road Area labelled 'The Gravel Pits' 165m E
1974/2003	The main building has been significantly developed/extended to the west/north-west	Electricity substations 22m SE and 54m N
2010 to present	Redevelopment of the main building (c.2004 based on anecdotal evidence)	No significant changes apparent

3.2 Database information

The database report includes information of local activities encompassing a range of subjects related to land use, pollution, and geological/hydrological conditions. Our assessment of contaminative uses and other environmental issues relevant to the site and its surroundings is provided below. The full database report (Groundsure Ref: SCL-6753702, 01/05/20) is included as Appendix B and this should be read and understood fully in conjunction with this summary.

Past land use

- Historical industrial land uses: numerous unspecified pits/ground workings and gravel pits within 250m, the nearest being 90m E
- Historical tanks: nearest are unspecified tanks 44/49m S
- Historical energy features: nearest are electricity substations 12m SE and 52m N
- Historical petrol stations and garages: none within 500m

Waste and landfill

- Active and historical landfills: none within 500m
- Waste exemptions: 14m N (37-45 Ducks Hill Lane; using waste exemption)

Current industrial land use

- Recent industrial land uses: Electricity substations 25m SE and 56m N
- Current or recent petrol stations: none within 500m
- Licensed pollutant release (within 250m): 435m E (Par Four Service Station; unloading of petrol into storage)
- Licensed Discharges to controlled waters: 123m NE (Mallard Way; sewage discharges into Cannon Brooke)
- Pollution incidents: 87m NW (smoke and firefighting run-off; minor land impact, significant air impact)

Hydrogeology

- Superficial aquifer: 'Secondary A' Aquifer 416m NW
- Bedrock aquifer: 'Secondary A' Aquifer on site, 'Unproductive Aquifer' 14m W
- Groundwater vulnerability: Medium vulnerability on site. Leaching class 'Low'
- Groundwater abstractions: nearest is 484m SW (Northwood Pumping Station)
- Source Protection Zones: Type 2 Outer Catchment on site, Type 1 Inner Catchment 184m W

Hydrology

- Water Network (OS MasterMap): 11m SE (inland river), 217mE (lake or reservoir), 218m E (inland river)
- Surface water features/bodies: none within 250m
- WFD Surface water body catchments: River Pinn catchment on site

River and coastal flooding

- Risks of flooding (RoFRaS), historical flooding and flood defences: none identified within 250m
- No Zone 2 or 3 floodplains or flood defences within 50m

Surface water and groundwater flooding

- Surface water flooding: the highest risk on site (and within 50m) is 1 in 30 year – 0.3m-1.0m
- Groundwater flooding: the highest risk on site (and within 50m) is 'low'

Environmental designations

- SSSI: nearest is Ruislip Woods 720m S
- National Nature Reserves: nearest is Ruislip Woods 938m S
- Local Nature Reserves: nearest is Batchwood Heath 925m NW
- Designated Ancient Woodland: nearest is Top Wood/French Grove 723m W
- Green Belt: London area Green Belt on site
- Nitrate Vulnerable Zones: none within 2km

Visual and cultural designations

- Listed Buildings: 6m NE (The Cottage, Northwood)

Agricultural designations

- Agricultural Land Classification: Grade 3 agricultural land on site

Habitat designations

- Priority Habitat Inventory: numerous records of deciduous
- Habitat networks: Network Enhancement Zone 2 220n N

Geology

- Superficial geology: none recorded on site
- Bedrock geology: Lambeth Group (very low to moderate permeability clay, silt and sand) recorded on site. London Clay 14m W
- BGS boreholes: none identified within 250m
- Natural ground subsidence: moderate risk of shrink-swell clays; very low to negligible risks for all categories where identified

Mining, ground workings and natural cavities:

- Natural cavities: none identified within 500m
- Britpits: nearest is Northwood Pits (Type A surface mineral working) 208m E
- Surface ground workings: unspecified pit 32m SE and 90m E, unspecified ground workings 143m E, 160m E, 175m NE and 205m E. Numerous records of ponds within 250m, the nearest being 111m N
- Non-coal mining: small scale underground chalk mining may have occurred on site. Potential for localised difficult ground conditions are at a level where they should be considered
- Mining cavities: nearest is 667m N (chalk)

Radon

- Less than 1% of properties affected, Radon protection measures not required

Soil chemistry

- BGS estimated urban soil chemistry, extract as follows:

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	11	1.9	89	61	0.8	56	29	17	8
On site	12	2.1	99	68	0.7	62	31	18	8
On site	12	2.1	72	49	0.7	55	24	17	7
On site	12	2.1	106	73	0.7	58	33	18	8
On site	12	2.1	117	80	0.7	63	38	19	8
On site	12	2.1	79	54	0.7	62	24	17	6

Railway infrastructure and projects

- No historical, current or proposed railways or tunnels within 250m

3.3 Other information

A contaminated land enquiry was lodged with Hillingdon Council. No response had been received at the time of compiling this report.

3.4 Walk-over survey

A site walk-over survey was undertaken on 22nd August 2022. A description of the general features of the site and the topography is provided in Section 2.0 above. From inspection of visible and accessible areas, a summary of specific features relevant to the land quality assessment is as follows:

Feature	Commentary
Electricity substations and transformers	None identified on site. Nearest is located about 20m S of site (Photo 10).
Fuel storage tanks	None present based on conversations with site management and on-site observations
Fuel interceptors	None observed
General chemical storage/waste	None observed
Invasive species	None observed
Evidence of gas	None observed

Feature	Commentary
protection	
Surface water contamination	↓ No surface/pooled water observed on site
Waste storage	↓ Bin storage area and waste skip present within northern part of the site (Photo 4)
ACMs	↓ None observed. Pre-2000 buildings may contain ACM's

3.5 Potential pollution linkages and Initial Conceptual Site Model

The information in the preceding sections has been used to undertake the Preliminary Risk Assessment and to compile the Initial Site Conceptual Model below. The assessment follows as risk-based approach, with the potential risks determined qualitatively using the 'source-pathway-receptor' linkage concept; a risk of harm may only exist where a plausible linkage is present. The assessment has been formulated based on the following table:

		Consequences			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Definitions of the risks are summarised as follows:

- **Very high:** high probability that severe harm could occur, or there is evidence that it is currently occurring. If realised, the risk could result in substantial liability. Urgent investigation/remediation
- **High:** harm is likely to occur, realisation is likely to present substantial liability. Urgent investigation required. Remedial works may be required in short-term, will be in long-term
- **Moderate:** possible that harm could arise, but unlikely to be severe. Investigation normally required to clarify risk and liability. Remedial works may be necessary in long-term
- **Low:** possible that harm could occur, but this would at worst be mild
- **Very low:** low possibility of harm, unlikely to be severe

The assessment has been carried out by identifying and evaluating the potential sources of contamination, the potential receptors and the plausible pathways for contamination migration are summarised as follows:

Potential sources of contamination

A summary of potential sources identified by our review of the above information is as follows:

- **Made ground:** historical maps indicate potential re-grading of the site c.1911; therefore, made ground may be present
- **Electricity substations:** 12m SE (1974-92), 52m N (1974-1984), 25m SE and 56m N (both current)
- **Potentially infilled land**: Unspecified pits 32m SE and 90m E. Several ponds between 111m N and 132m N and between 21m and 131m E/SE. Former gravel pits 208m E

It should be noted that any developed, non-greenfield land is likely to contain made ground. This will probably be of uncertain or unknown origin and may contain contaminants that have not been specifically identified.

The assessed risks from these potential sources are summarised in the Initial Conceptual Site Model below.

Potential receptors

In the context of the proposed development, the following potential receptors have been identified:

- Human health: inhabitants/users of building, construction workers, adjacent site users
- Controlled waters: Secondary 'A' bedrock aquifer beneath site which may be in hydraulic conductivity with the underlying chalk aquifer. The site is within a Type 2 Source Protection Zone (outer catchment) and the nearest surface water feature is 11m SE. The site is assessed as being of **medium environmental sensitivity**
- Building fabric and services: buried foundations, basement wall, potable water pipes

Plausible pathways

- Ingestion of soil, dust or water
- Inhalation of dust, gas or vapours
- Direct physical contact with contaminated soil/water
- Vertical and lateral migration of contamination including leaching
- Chemical attack of building infrastructure, including water supply pipes
- Migration of ground gas/vapour through permeable soils or open pathways

The Initial Conceptual Site Model and an estimate of the risk associated with each potential linkage is shown in the following table:

Source	Pathway	Receptor	Assessed risk and commentary/justification
On-site: contaminated soil and groundwater	Ingestion, contact, inhalation	End user, construction workers and infrastructure	**Low / moderate risk:** the PRA has identified made ground, associated with historical re-grading of the site, as the main potential contamination source. Pre-2000 buildings present on site which may contain asbestos
	Leaching from contaminated soils and migration in groundwater	Aquifer and surface water	**Low risk:** there is a Secondary 'A' bedrock Aquifer beneath the site, which may be in hydraulic conductivity with the underlying chalk aquifer. No significant onsite contamination sources were identified and therefore the risk to the aquifer is expected to be low. The site lies within a Type 2 Outer catchment SPZ and there are no nearby abstraction points; the nearest surface water feature is 11m distant
Off-site: contaminated soil	Lateral migration of contaminants to site in groundwater	End user	**Low risk:** main potential sources are the nearby electricity substations. These are considered to be of low/limited risk due to low mobility of PCBs in groundwater
On-site and off-site: ground gas and vapours	Lateral and vertical migration of gas/vapour	End-user and buildings	**Low risk:** low/limited risk of ground gas/vapours associated with made ground on site and nearby potentially infilled land. The site is not in a radon affected area

The overall risk rating for the site is assessed as being **Low**.

3.6 Recommendations for intrusive investigation

The Initial Conceptual Site Model identified potential pollution linkages resulting in the overall assessed risk rating of moderate. The following programme of intrusive investigation is recommended:

- Suitable intrusive investigation to confirm the ground sequence, allow soil/water sampling and the installation of monitoring pipes
- Made ground was identified by the PRA as the main potential contamination source, and therefore the investigation should provide general coverage of the site. Electricity substations present off-site are considered low risk
- Soil and groundwater samples should be recovered where relevant and be analysed for a range of general contaminants to include metals/semi-metals, petroleum hydrocarbons, asbestos screening and specifically PCBs
- Groundwater and gas monitoring

The Initial Conceptual Site Model should then be revised to include complete pollution linkages and outline mitigation/remedial measures should be identified, together with any requirements for additional investigation.

4.0 EXPLORATORY WORK AND LABORATORY TESTING

The ground investigation was carried out in August 2022 and is described below.

4.1 Constraints of investigation

The investigation was carried out in accordance with the scope produced by London Structures Lab (dated 24.05.2022). This document determined the scope of the investigation and the locations of the exploratory points.

4.2 Rotary auger boreholes

Two boreholes (BH01 and BH02) were completed using a specialist solid stem rotary auger drilling rig to a depth of 18.0m below ground level (bgl). In-situ testing (SPT) was carried out at regular intervals and the hammer Energy Ratio (E_r) for the equipment used was 83%; the relevant certificate is appended. Disturbed/undisturbed samples were taken for geotechnical and geo-environmental testing, and PID headspace testing was carried out on shallow made ground and natural soil samples. A 50mm internal diameter combined water/gas monitoring pipe was installed in both boreholes to a depth of 5.0mbgl.

An additional shallow borehole (BH03) was constructed in order to facilitate basic falling head soakage testing. However, a significant thickness of made ground was identified at this locality and groundwater was encountered at 1.50m depth. In agreement with the structural engineers, soakage testing was undertaken within a dynamic sampler borehole (WS03).

4.3 Dynamic sampler boreholes

Three dynamic (windowless) sampler boreholes (WS01 to WS03) were completed using a tracked drilling rig to depths of between 4.0m and 5.0mbgl. Standard Penetration Tests (SPT) were undertaken at regular intervals and representative samples taken for geotechnical and environmental testing. The appended calibration certificate for the SPT equipment used indicates the Energy Ratio, Er, of 81%. Basic falling head soakage testing was undertaken in WS03 to assess the feasibility of full-scale soakage testing. 35mm internal diameter combined water/gas monitoring pipes were installed in WS01 and WS02 to depths of 4.0m and 5.0mbgl respectively. both boreholes to a depth of 5.0mbgl.

4.4 Hand excavated trial pits

Three trial pits (TP01 to TP03) were excavated using hand tools against the existing buildings to expose, and record details of, the existing foundations.

4.5 Shallow soil sampling

Five shallow soil samples (S01 to S05) for contamination testing were obtained from within the proposed garden area using hand tools.

4.6 Groundwater and gas monitoring

A single groundwater/gas monitoring was carried following completion of the site works on 30th September 2022.

4.7 Geotechnical laboratory testing

The following geotechnical laboratory testing was completed:

- Index properties tests (Atterberg Limits)
- Particle size distribution tests
- Unconsolidated, undrained triaxial tests

4.8 Chemical and contamination testing

Selected soil samples were delivered to a specialist laboratory (DETS Ltd) and the following testing was carried out:

General soil suite	-	8no samples
Asbestos screening	-	8no samples
PCBs	-	1no sample
Waste Acceptance Criteria (WAC)	-	2no samples
Soluble sulphate/sulphur/pH analyses	-	10no samples

The engineering borehole records, trial pit logs and the laboratory testing results are included in Appendix A.

5.0 GROUND CONDITIONS

Published BGS information (1:50,000 and 1:10,000 scale maps) indicates that the site is underlain by the Lambeth Group which rests upon the Seaford and Newhaven Chalk Formations. This sequence was confirmed beneath a variable thickness of made ground, and is summarised as follows:

Stratum	Depth to base	Level at base	Thickness
Topsoil and made ground	Varies between 0.60m and 2.75m	Varies between +71.30mOD and +68.20mOD	Up to 2.90m
Geologically Re-worked Lambeth Group (Light greyish/orangish/bluish brown slightly gravelly silty CLAY)	Varies between 2.75m and 3.0m where proven; locally absent	Varies between +71.30mOD and +66.45mOD	Between 1.75m and 2.20m where proven
Lambeth Group clay (Bluish/orangish/reddish brown silty CLAY)	Varies between 3.0m and 4.75m where proven; locally absent	Varies between +68.90mOD and +64.45mOD	Between 0.90m and 3.30m where proven
Lambeth Group sand (Light greyish brown/greyish green silty SAND to sandy GRAVEL)	Between 9.00m and 10.50m where proven	Between +61.00mOD and +60.20mOD	Between 7.75m and 9.00m where proven
Seaford and Newhaven Chalk	Base not proven, extended to maximum borehole depth at 18.0m	Below +51.20mOD	Not proven

Detailed descriptions are presented on the exploratory hole records and the ground sequence is represented on the geological cross sections; this information is appended.

5.1 Made ground

Made ground was encountered beneath a nominal layer of dark brown topsoil and was present to depths of between about 0.60m and 2.90mbgl. These non-engineered soils typically comprised brown/dark brown clay with variable gravel of brick, flint, tile, chalk and charcoal, locally grading to brown/black ashy gravelly sand. A significant thickness of made ground within the central and northern part extents (WS02, BH02 and BH03) may indicate historical re-grading of the site. Indeed, some potential re-grading is shown on the historical maps c.1913-1914.

Standard Penetration Tests (SPT) 'N' values of between 4 and 9 were measured indicate low to high strength clay soils/loose to medium dense granular soils.

5.2 Lambeth Group clay

Natural clay soils that we consider represent the Lambeth Group were encountered beneath the made ground and, where the base was proven, extended to depths of between 3.0m and 4.75mbgl, attaining a

maximum thickness of 3.75m in BH01. These clay soils appeared to be absent in BH03 and may have been removed/replaced, as evidenced by a significant thickness of made ground at this locality. The soils generally comprised light brown/reddish brown/orangish brown/bluish grey mottled silty clay with a variable flint gravel content and occasional calcrete pockets.

SPT 'N' values of between 6 and 23, and hand shear vane values of between 40kN/m^2 and >120kN/m^2 were recorded in the clay soils. However, we consider that some of the higher bound values (such as shear vanes values >120kN/m^2 in WS02 and WS03 and a triaxial result of 304kN/m^2 in BH01) probably reflect elevated soil strengths due to the presence of desiccation. On this basis, we consider the characteristic strength values are indicative of generally medium to high, locally low strength clay. Atterberg limit testing indicates the clay soils to be of generally intermediate plasticity (BS classification) and medium volume change potential (NHBC classification).

5.3 Lambeth Group sand

Granular soils of the Lambeth Group were encountered clay at depths of between 2.90m and 4.75mbgl and, where the base was proven, extended to depths of between 9.0m and 10.50mbgl, attaining a maximum thickness of 7.50m in BH02. These soils generally comprised light brownish and greenish grey silty gravelly sand grading into silty sandy flint gravel.

SPT 'N' values of between 24 and >50 (refusal), are indicative of a generally medium dense to dense, becoming very dense, state of compaction. Particle size distribution (PSD) analysis indicates a sand content of between 35% and 95%, with gravel varying between 6% and 51% and fines between 5% and 27%.

5.4 Seaford and Newhaven Chalk

Chalk was encountered below the granular soils of the Lambeth Group at depths of between 9.0m and 10.50mbgl, and was present to the maximum depth investigated (18.0mbgl).

The boreholes were constructed using the solid stem auger method, which provides SPT profiling but does not allow for determination of CIRIA chalk grades. Visual observations and logging indicated the disturbed samples to generally comprise off white to cream, comminuted chalk silt with variable intact chalk gravel content and rare flint nodules.

In-situ SPT 'N' values of between 13 and >50 (refusal) were recorded within the chalk, generally showing an increasing 'N' value with depth, which we consider indicates reasonably competent chalk.

5.5 Groundwater

Groundwater inflow was not observed during drilling with the boreholes remaining dry. However, groundwater was present in BH03 struck/standing at a depth of 1.50mbgl; we consider this probably represents a localised perched groundwater within a deep area of made ground at this location. The monitoring pipes were dry during post-fieldwork measurements undertaken on 29th September 2022. Of course, groundwater levels can vary seasonally and may be higher following periods of wet weather. It is recommended that the borehole installations are monitored periodically prior to construction.

5.6 Desiccation

A number of densely planted mature trees are present in close proximity to, and within, the proposed development areas. The tree survey information provided indicates species present to include high water demand oak, cypress and hawthorn, and moderate water demand ash, pine, sycamore, birch, beech and wellingtonia.

The site is assessed by the BGS to be in an area of 'moderate' hazard with regards to shrinking and swelling ground stability. Our investigation revealed the presence of generally medium volume change potential clay soils at shallow depth across the majority of the site, and therefore we consider this assessment should be upgraded to 'high' risk. In assessing desiccation, we have considered the measured soil strengths, moisture contents, the presence of roots and our visual observations. Based on the above the following observations are of note:

- Live roots observed within all boreholes (with the exception of BH02) to depths of between 2.00m and 3.00mbgl.
- Elevated shear strengths (hand shear vanes values of >120kN/m^2 and hand penetrometer results of >6kg/cm^2) to depths of 3.0m and 2.0mbgl in WS01 and WS02 respectively. Triaxial test result of 304kN/m^2 in BH01.
- Reduced moisture contents (generally <15%) to depths of between 2.50m and 3.50mbgl in WS01 and WS03. Negative liquidity index values measured within the vast majority of clay samples tested.

On this basis, we consider that the shallow clay soils are desiccated, or at least partially desiccated, to depths of between about 2.00m and 3.50mbgl due to the presence of existing trees/vegetation. Our investigation has provided only limited coverage of the site, and it is self-evident that zones of desiccation may extend to greater depths in areas not covered by our investigation, and in particular close to the areas of closely spaced mature trees.

5.7 Existing foundations

Three trial pits (TP01 to TP03) were excavated to provide details of the foundations of the neighbouring building and boundary wall. The findings from the trial pits are included in the Appendix as briefly summarised below:

Trial pit	Location	Foundation base depth	Projection from face of adjacent wall	Bearing stratum
TP01	Derelict bungalow	0.70m	0.15/0.30m	Light orangish brown/grey mottled slightly gravelly clay – possible natural soils
TP02	Accommodation block	Not proven	>0.60m	Not proven
TP03	Derelict apartment building	1.20m	0.28/>0.5m	Light brown/grey mottled silty CLAY with occasional flint gravel

5.8 Environmental observations

No obvious olfactory or visual signs of soil or groundwater contamination were encountered in the boreholes. PID headspace testing (for VOC concentrations) was undertaken on samples of made ground and natural soils during the borehole exercise and during subsequent monitoring - no elevated levels were noted.

6.0 GEOTECHNICAL ASSESSMENT

The proposed works at this site include the re-development of the wider site, including the demolition of several existing, derelict, buildings, and the construction three new buildings (linked via a glass covered walkways), landscaped areas and outdoor amenities. Based on the information provided, details of the proposed new buildings are as follows:

- Building A: a detached two-storey building replacing an existing bungalow within the southern part of the site.
- Building B: a detached three-storey building incorporating a partial single level basement beneath, replacing an existing two storey building within the northern part of the site.
- Building C: a large single storey side extension to the existing main accommodation block, connected to both Building 'A' and Building 'B' via a glass covered walkway.

A plan showing the latest development proposals is presented in Appendix A. Foundation loads were not available at the time of compiling this report.

The investigation has revealed that beneath a variable thickness of topsoil and made ground (up to 2.90m in our boreholes) the natural Lambeth Group is present to depths of between 9.0m and 10.50mbgl, resting upon the Seaford and Newhaven Chalk which extends to at least 18.0m depth. The shallow Lambeth Group generally comprise an upper layer of geologically re-worked clay soils overlying 'in-situ' clay soils, both of which are at least partially desiccated; granular Lambeth group soils are present at depths of between 2.75m and 4.75m.

We understand that, due to protection orders on a number of the existing trees, the requirement for foundation excavations must be minimised within the designated Root Protection Areas (RPA). Therefore, where the proposed buildings are within the RPAs, traditional spread foundations are unlikely to be feasible. Whilst traditional spread foundations could theoretically be adopted if final design proposals indicate buildings are outside the RPA, our investigation has revealed the shallow clay soils to be desiccated to variable depths, and without a more comprehensive investigation we consider there is a significant risk of deep desiccation and associated shrink/swell movement. Therefore, we consider pile foundations would present the most practical solution. Notwithstanding this, where basements are proposed, spread foundations could be adopted, if formation level is below the zone of assessed desiccation or lies within granular non-shrinkable soils.

As with any site underlain by chalk, consideration will need to be given to the potential presence of solution features, and this is discussed further below.

6.1 Ground stability and chalk dissolution

Dissolution features within the chalk occur due to erosional processes during the last periglacial period/environment. The independent report commissioned from Groundsure (Ref: 8995154) collates information on historical mining and natural cavities recorded in the vicinity of the site and is included in Appendix B. The report indicates that there are no recorded natural cavities within 500m of site and it assesses the risk of potential for ground dissolution stability hazards as being 'negligible'. In addition to the Groundsure report we have undertaken a natural cavities risk assessment using Edmonds procedure (Engineering Geology Special Publications No.18, 2001); this assessment indicates that subsidence hazards are 'Very Low'.

With regards to mining and quarrying, the report indicates the nearest BGS 'BritPits' mineral site to be 208m east of the site (chalk pit); the nearest historical ground working is recorded 32m south-east. The potential for localised small-scale non-coal historical mining on site is considered to be at a level where the risk of localised 'difficult' ground conditions should be considered.

Our investigation has revealed chalk 'rockhead' at a depth of about 9.00m and 10.50mbgl. Whilst a detailed solution feature risk assessment was not within the scope of our investigation, we consider SPT 'N' values of between 13 and >50 (refusal) recorded to be indicative or relatively competent chalk.

Notwithstanding the above, it should be noted that the presence of solution features cannot be totally ruled out without a much more comprehensive investigation. Therefore, a careful watching brief should be kept during construction, and if anomalous ground conditions are encountered then specialist advice should be sought from geotechnical contractors experienced in providing options for further investigation and potentially additional remedial measures. Dynamic probing of the proposed pile locations/foundation lines would reduce the risk of unexpected ground conditions being encountered at a late stage during construction.

6.2 Buildings A and C

Proposed buildings A and C comprise new a detached two-storey apartment building and single storey café/dining extension to the main accommodation building respectively. Whilst structural loads are unavailable, we anticipate these structures would generate relatively low to modest loads. Pile foundations are considered the most appropriate foundation for these buildings due to the presence of RPAs and desiccation of the shallow clay soils.

Piled foundations

For the ground conditions encountered, we consider that CFA piles, bearing within the competent chalk, will present the optimum type although helical screw piles and / or driven piles could be considered subject to potential desiccation effects being overcome. The following table of coefficients may be used for the preliminary determination of pile resistance.

Shaft friction/adhesion

Stratum	Depth	Ultimate unit shaft friction, 'q_s' (kN/m²)
All soils to 3.50m depth	Up to 3.5m	Ignore
Lambeth Group (assume sand)	Between about 3.5m and 9.0m	25
Chalk	Below 9.0m depth	0.8 x σv'

Notes:

a) Shaft friction in the chalk is calculated as qs = σv' x β, where β = 0.45 for CFA piles with part of the shaft in weak soils (N<20). For well-constructed rotary bored piles a β value of 0.8 may be used in the chalk and the above shaft friction values in the chalk may be increased by about 80%

b) Sequence based on BH01 ground conditions

Base resistance

Stratum	Depth	Ultimate base resistance, 'q_b'
Chalk	12m to 18m	'q_b' = 1600kN/m² Note that CIRIA C574 also recommends that the allowable base resistance (q_{all}) should not exceed 1000-1800kN/m² for SPT 'N' >25. We recommend that q_{all} = 1600kN/m² is adopted for preliminary design

Notes:

a) The base resistance assumes SPT 'N' > 25

Under EC7 (BS EN 1997-1:2004 and UK National Annex) the limit states GEO and STR must be verified using Design Approach 1, which checks reliability with two different combinations of partial factors. The following partial factors are applicable to bored and CFA piles, to be used in conjunction with a Model Factor of 1.4:

Parameter			Combination 1			Combination 2			
			A1	M1	R1	A2	M1	R4	R4+
Permanent actions (G)	Unfavourable	γ_G	1.35			1.0			
	Favourable	$\gamma_{G,fav}$	1.0			1.0			
Variable actions (Q)	Unfavourable	γ_Q	1.5			1.3			
	Favourable	$\gamma_{Q,fav}$	0			0			
Material properties (X)		γ_M		1.0			1.0		

Parameter		Combination 1			Combination 2			
		A1	M1	R1	A2	M1	R4	R4+
Base resistance (R_b)	γ_b			1.0			2.0	1.7
Shaft resistance (R_s)	γ_s			1.0			1.6	1.4
Total resistance (R_t)	γ_t			1.0			2.0	1.7
Tensile resistance ($R_{s,t}$)	$\gamma_{s,t}$			1.0			2.0	1.7

For guidance purposes, indicative pile resistances for CFA/bored piles are as follows, calculated using the above preliminary parameters and partial factors where relevant:

Pile diameter (mm)	Pile toe level (mOD)	Pile toe depth (m)	Compressive Resistance (kN) Combination 1	Combination 2
300	+57.2	12	290	195
	+54.2	14	540	325
	+51.2	18	795	485
450	+57.2	12	465	325
	+54.2	14	870	520
	+51.2	18	1250	760

Notes:

a) Concrete stress should be considered in the final design

b) Pile toe depth is relative to existing ground level (approximately +69.2mOD)

c) Pile resistances are given as a guide and do not constitute design recommendations

The design engineer must ensure that the correct comparisons are made between the properly factored Design Actions and Design Resistances. The above pile resistances have incorporated the required partial factors for ULS design but do not incorporate explicit checks on serviceability. The presence of shrinkable soils and trees close to the footprint of the proposed structures means heave precautions will be required, in accordance with NHBC Standards Sitework clause S4(c). In the above parameters table, we have recommended that all soils to 3.5m depth are ignored due to potential desiccation. The pile designer will need to assess potential tensile forces and specify appropriate reinforcement.

Whilst we do not consider chalk dissolution to be a significant risk at this site and no loose soils or voids associated with the presence of solution features have been identified in the boreholes, consideration must be given to the possibility of their presence and an appropriate contingency should be in place during piling should anomalous ground conditions be encountered. The piling contractor should assess the risk and prepare appropriate mitigation measures. It is also noted that a significant thickness of made ground is present in some areas and thus the possible presence of obstructions should also be taken into consideration.

A piling specialist must be consulted at an early stage to advise on the most appropriate pile type and to ultimately provide the final pile design. If pile testing is undertaken, it will be possible to apply lower partial factors.

6.3 Buidling B

Building B comprises a three-storey apartment block with a single level basement beneath. No structural loads are available, but we anticipate this structure would generate moderate to high loads. Either traditional spread foundations or a raft, bearing within the natural Lambeth Group at basement level, are considered appropriate to support this structure.

Basement excavation and retaining walls

Based on the information provided an excavation depth of about 3.60m will be required to form the basement, which we assume will comprise an RC box with the new basement walls and floor slabs providing long term support. The excavation is expected to encounter a variable thickness of made ground, possibly up to about 3.0m thick locally, overlying the Lambeth Group; based on our boreholes (BH03 and WS03), both granular and cohesive Lambeth group soil may be exposed at formation level. If space permits, it should be possible to construct the basement in an open battered excavation. Alternatively, sheet piles or contiguous bored piles would provide an alternative option for an embedded retaining wall, subject to any issues with noise/vibration being addressed.

Whilst groundwater was encountered at a depth of about 1.50m in BH03, we consider this probably represents a pocket of perched groundwater within the localised thick made ground, as water was not observed within the remaining boreholes constructed in close proximity (BH02 and WS03). A trial excavation is recommended to the full basement depth to confirm groundwater levels/flow volumes and excavation stability; this will assist in determining support requirements and any need for further control measures, such as sump pumping.
Careful selection of the appropriate design parameters will be needed, incorporating allowances for factors such as the presence of groundwater.

The following table of coefficients may be used for the preliminary design of the basement retaining wall:

Stratum	Bulk density (Mg/m^3)	Effective cohesion, c′ (kN/m^2)	Effective friction angle, ϕ' (degrees)
Made ground	1.80	0	22
Lambeth Group (clay)	2.00	0	21
Lambeth Group (sand)	2.00	0	35

Eurocode 7 stipulates that partial material factors must be applied to the best estimates of geotechnical soil properties during the design stage. The design engineer must ensure that the correct comparisons are

made between Design Actions and Design Resistances after the application of appropriate partial factors. The determination of appropriate earth pressure coefficients and the pattern of earth pressure distribution should be carried out by the geotechnical designer; these will depend upon the type/geometry of the wall and the overall design approach. Of course, where the retaining wall is constructed against a battered slope, the active earth pressures will also be determined by the type of backfill placed. The final wall design and working sequence/procedure should be undertaken by suitably qualified professionals.

Clay desiccation should be considered in areas close to existing vegetation, particularly along the northern elevation where there are trees present close to the proposed footprint, including a mature oak tree and line of conifers. Although the basement excavation is expected to extend beyond the zone of root influence from existing vegetation and will remove any seasonally-affected soils, the wall designer should address the possible risk of there being desiccated clays behind the wall and incorporate appropriate measures. Where an open excavation is used, any significantly desiccated/root-infested clay soils should not be used to infill behind the wall unless appropriate conditioning is undertaken to prevent any potential clay swelling and associated heave. Alternatively, a compressible material could be installed behind the wall as a safeguarding to reduce potential future swelling pressures which could occur.

Basement raft

We consider the natural Lambeth Group soils would offer a suitable bearing stratum upon which to construct a raft. At the time of compilation of our report, design pressures for the raft were not available; however, for this form of construction, we do not envisage that the UDL of the raft would exceed about 50kN/m^2. For a 3.6m dig, there would be a net unload of about 70kN/m^2 and hence it is unlikely that the new building load would generate a net increase in stress on the natural soils. If a UDL is not achievable and structural loads are concentrated as line or point loads these could be carried by thickenings within the basement slab subject to spread foundation design recommendations below.

Based on the borehole records there may be a very limited thickness of clay remaining above the granular soils across part of the footprint. Whilst in theory, there would be an element of heave and heave pressure from this clay, for the thickness involved, this is expected to be negligible for design purposes. The underlying granular soils would not exhibit the same heave characteristics. We do not anticipate that desiccation effects would require special precautions at basement level.

It will be necessary to consider uplift of the slab due to potential hydrostatic pressures and in this respect the guidelines incorporated in BS8102:2009 should be followed. The slab design will need to take account of potential seasonal fluctuations and/or accidental and flood conditions. Although the water levels are currently well below basement level (dry conditions to the base of all boreholes and within the installation from the investigation) the basement will be wholly within the clay stratum and thus accidental flood conditions could exist; indeed, there is potential for water to be present within the made ground which is currently standing at about 1.50m below ground level. We consider that a design water level at 1m below ground level would be appropriate which would result in a hydrostatic uplift pressure of about 25kN/m^2. This figure would need to be agreed with the local building control.

Basement spread foundations

The structural loads could be carried by discrete pad or strip foundations at basement level. At Formation level, both granular and cohesive Lambeth Group soils are expected to be exposed and therefore, where clay soils are present, foundation excavations should be deepened to bear within the underlying granular soils. Any effects of root growth and desiccation are not expected to adversely affect the design of foundations at basement level; however, foundation excavations should of course be inspected to ensure a suitable formation level has been achieved.

For preliminary assessment of the feasibility and sizing of foundations placed within the natural granular soils, an allowable bearing resistance of 150kN/m^2 would be appropriate; this would be applicable to moderate sized strip or pad foundations, say up to 2.5m width. As required by EC7, the design engineer must ensure that the correct comparisons are made between Design Actions and Design Resistances after the application of appropriate partial factors and using the final base geometry. For ULS design the bearing resistance should be determined, using undrained and/or drained analysis as appropriate, to calculate the degree of utilisation of the foundation (limit state GEO). SLS checks should be carried out using appropriate methods in accordance with current practice.

6.4 Ground floor slabs (Buildings A & C)

Our investigation has revealed up to 2.75m of non-engineered made ground generally overlying shrinkable clay soils. Therefore, suspended floor slabs should be adopted for new buildings where basements are not proposed, supported by the main foundations, and incorporating a suitable void beneath based on medium volume change susceptible soils.

6.5 Soakaways

A falling head infiltration test was undertaken within borehole WS03 at a depth of 4.0mbgl. The testing resulted in no measurable fall in the level of water over a period of about 2 hours, indicating the soils to be practically impermeable. On this basis, we consider that traditional soakaways, constructed within the shallow clay soils, are unlikely to provide a suitable method of disposing of surface run-off. The deeper, granular, layers of the Lambeth Group may provide higher infiltration rates; however, these may prove impractical to construct due to the depth of the granular soils. If shallow soakaways within the granular layers of the Lambeth Group are to be adopted, infiltration rates should be confirmed following full-scale testing in accordance with the BRE DG365 procedure. We consider a deep borehole soakaway, constructed within the underlying chalk, may provide a practical alternative, subject to guidance contained within CIRIA C574.

As the site lies above chalk the use of soakaways should be approved by the Environment Agency. As established above, this site is assessed as being low risk with respect to solution features. The guidance contained within CIRIA C574 should be followed and therefore soakaways must be placed a minimum distance of 10m from any existing or proposed structure.

6.6 Foundation concrete

Low concentrations of water-soluble sulphates (2:1 water/soil extract) were measured in selected made ground and natural soil and samples, with near neutral to slightly alkaline pH values. The results fall into Site Design Class DS-1 of Table C2 given in BRE Special Digest 1 (2005). We assess the site as having 'static' groundwater and this would result in an ACEC Site Class of AC-1s.

7.0 STAGE 1 TIER 2 ENVIRONMENTAL ASSESSMENT

This appraisal is generally based on the Environment Agency's 'Land contamination: risk management', 2020, adopting current UK practice which uses the Source-Pathway-Receptor methodology to assess contamination risks. For a site to be designated as contaminated a plausible linkage between any identified sources and receptors must be identified, ie whether significant pollution linkages (SPLs) are present. In considering the potential for contamination to cause a significant effect, the extent and nature of the potential source are assessed and pathways/receptors identified; without an SPL there is theoretically no risk to the receptors from contamination. The assessed risks to the various potential receptors are summarised in the tabulated Conceptual Site Model which forms Section 7.6 of this report.

7.1 Environmental setting and context

The site is underlain by a Secondary 'A' bedrock aquifer beneath site which may be in hydraulic conductivity with the underlying chalk (which is a principal aquifer). The site lies within a Source Protection Zone II and the nearest surface water feature is 11m from site

The site is assessed as being of **Medium** environmental sensitivity.

7.2 Contamination sources and testing

The Preliminary Risk Assessment is presented in Section 3.6 and this identifies significant potential sources of contamination and the associated risks. The testing comprised analysis of eight soil samples for a range of contaminants which were considered to reflect the potential historical/current site usages and the potential sources. Specifically, analysis for PCBs was included to reflect the presence of an electricity substation 20m from the southern boundary.

The soil test results have been assessed where relevant against the DEFRA Soil Guideline Values (SGV) and Category 4 Screening Levels (C4SLs), together with the LQM/CIEH Suitable 4 Use Level (S4UL) for Human Health Risk Assessment in which Generic Assessment Criteria (GACs) have been derived from the CLEA Model (2nd Edition, 2009). The contamination testing was carried out specifically for the purpose of providing a general guidance evaluation for the proposed development. Reference should be made to the foreword to the appended contamination test results in order to fully understand the context in which this discussion should be viewed.

The redevelopment will a combination of buildings/hardstanding and landscaped areas with its primary use as a care home facility. We have used, where relevant, the trigger levels for **Public Open Space (Residential)** to assess the results of the contamination testing.

Using the relevant the trigger levels, all of the results fell below the threshold values, with the following exceptions.

- **Benzo(a)pyrene:** a slightly elevated concentration of 6.53mg/kg was measured in one sample of made ground (S1 @ 0.2m depth), when compared to the C4SL threshold level of 5.7mg/kg.

The results of the testing suggest that there is no discernible contamination present at the sampling positions, a localised elevated Benzo(a)pyrene concentration was present in one sample. It should be noted that there may of course be pockets of undetected contamination between exploratory points.

Although Asbestos-Containing Materials (ACM) were neither observed on site nor identified in the samples examined, we note that buildings (especially those constructed before 2000) are a potential source of ACM. Furthermore, any made ground, construction or demolition materials on site may also contain ACM. These matters should be addressed in the Pe-construction H&S plan prior to any demolition or earthworks.

The implications of these results are addressed in the revised Conceptual Site Model below.

7.3 Ground gas/vapour monitoring

The PRA identified a potential gas risk from potentially infilled land associated with historical ground workings/pits, the nearest being recorded about 30m south-east of site. Gas monitoring was undertaken on one occasion following completion of the fieldwork, as agreed with the client. A maximum carbon dioxide concentration of 5.0% was recorded in BH01, while no elevated concentrations of methane, hydrogen sulphide and carbon dioxide were measured. PID readings in the borehole installations were generally <1ppm, with one measurement of 5.0ppm in WS02. The maximum measured flow rate was 0.2 l/hr in WS01. On the basis of the initial gas monitoring results, we consider that Characteristic Situation 2 (low risk) is appropriate at this stage (as described in CIRIA C665 "Assessing risks posed by hazardous ground gases to buildings", 2007) and gas protection measures will need to be incorporated accordingly. However, it may be possible to adopt a 'building by building' approach to gas protection measures, in which case a CS1 (very low risk) classification could be adopted for buildings B and C. We recommended additional monitoring is undertaken to allow a full assessment of the ground gas regime over an extended period, and this may allow the less onerous classification to be adopted for all the buildings, subject to the results; a further five visits is considered appropriate. This approach should be confirmed with the local authority building control/EA.

7.4 Disposal of excavated soils

A rigorous hazard assessment of the results was not within the scope of our investigation, but our preliminary conclusion from the contamination and WAC testing (where total polyaromatic hydrocarbons were elevated in one sample) is that the made ground will probably classify as 'stable non-reactive hazardous waste in no-hazardous landfill' with an 'inert' classification for the natural soils. Early consultations should be made with appropriate waste facilities or regulators to confirm the off-site disposal requirements.

7.5 Refined Conceptual Site Model

Taking into account the above discussion, the assessed risks to potential receptors identified in the PRA are summarised in the refined Conceptual Site Model (CSM) below. This includes recommendations for appropriate mitigation measures to render any SPLs inactive and reduce the risks to receptors to acceptable levels:

Source	Pathway	Receptor	Assessed risk, justification and measures to mitigate the risk to acceptable levels
On site: contaminated soil/water	Ingestion & direct contact	End user	**Low:** - The PRA identified made ground as the main potential contamination source. No visual or olfactory evidence of gross contamination was identified in any of the soil samples. - All measured concentrations were below the relevant threshold values in the samples tested (including made ground) except for slightly elevated Benzo(a)pyrene in one sample. - The proposed development will result in the removal of some of the made ground (ie the main identified potential contamination source) and development areas of the site will be covered by new floor slabs and areas of hardstanding, which will provide an effective barrier to end users. Therefore, the SPL to human health will be inactive in these areas. - The SPL to human health will be active in proposed landscaped areas, where elevated Benzo(a)pyrene was measured locally. Risk to end users should be mitigated by the removal of all made ground in this area replacing with certified clean topsoil. Alternatively, close-centred sampling/testing of the shallow soils in this area may potentially permit the re-use of the soils on site if the elevated concentration is shown to be a 'hotspot' and removed
	Ingestion, contact & inhalation	Construction workers and third parties	**Low:** - The SPL to human health created by the presence of slightly elevated Benzo(a)pyrene will be active during construction. The risks to these receptors will be managed through health & safety procedures and CDM regulations - A careful watching brief should be kept during construction and if obvious or suspected contamination is encountered this should be dealt with prescriptively
	Leaching from contaminated soils and migration in groundwater	Aquifer and surface water	**Low:** - The site is assessed as being of 'medium' environmental sensitivity - A proportion of the made ground will be removed during construction and the new development will reduce the amount of water infiltration into the ground - A thick sequence of low permeability clay is present across much of the site which will reduce migration into the underlying aquifer
	Direct contact with soil/water	Building fabric and infrastructure	- The effects of soluble sulphates and alkali/acidic ground are discussed in Section 6.4 of this report - Detailed assessment of soil/groundwater contamination with respect to water supply pipes is outside the scope of this report. See the relevant water authority requirements and UKWIR 'Guidance for the selection of water supply pipes to be used in brownfield sites', 2010.

Source	Pathway	Receptor	Assessed risk, justification and measures to mitigate the risk to acceptable levels
Off site: contaminated soil/water	Lateral migration of contaminants in groundwater	End-user and buildings	**Low:** • No significant off-site sources identified by the PRA with the exception of the nearby electricity substation. No significant visual or olfactory evidence of contamination was noted in the samples recovered and the vast majority of measured concentrations were below relevant threshold values, including PCBs
On-site and off-site: ground gas & vapour	Lateral migration through strata, service runs and cracks in buildings	End-user and buildings	**Low / Moderate:** • The PRA identified a low risk of ground gas/vapours from nearby potentially infilled land. Made ground is a potential source of ground gas. Initial gas monitoring suggests that CIRIA 665 CS2 applies based on worst case scenario, and additional monitoring is recommended with final gas characteristic situation being agreed with the local regulatory authority. • The site is not within a radon affected area

In conclusion, based upon the information reviewed and the results of the investigation, our assessment is that with the localised removal of made ground within the area of slightly elevated benzo(a)pyrene and replacement with certified clean topsoil it should be possible to reduce the risks to acceptable levels. Alternatively, close centred sampling/testing of this area may permit the re-use of soil on site, if the localised contamination is shown to be a 'hotspot' and removed.

The investigation has provided general coverage of the site and it is self-evident that there may be zones of contamination within the site which were not encountered.

A careful watching brief should be kept during construction to ensure that any potentially contaminated soil encountered is disposed of in a safe and controlled manner. Site workers should observe normal hygiene precautions when handling soils and if material suspected of being contaminated is identified during construction, this should be set aside under protective cover and further tests undertaken to verify the nature and levels of contamination present. If contamination is present, a full site re-assessment may be required and a contingency should be in place in this regard.

Additional gas monitoring is recommended and a total of six readings should be undertaken in accordance with good practice.

GENERAL INFORMATION, LIMITATIONS AND EXCEPTIONS

Unless otherwise stated, our Report should be construed as being a Ground Investigation Report (GIR) as defined in BS EN1997-2. Our Report is not intended to be and should not be viewed or treated as a Geotechnical Design Report (GDR) as defined in EN1997-2. Any 'design' recommendations which are provided are for guidance only and are intended to allow the designer to assess the results and implications of our investigation/testing and to permit preliminary design of relevant elements of the proposed scheme.

The methods of investigation used have been chosen taking into account the constraints of the site including but not limited to access and space limitations. Where it has not been possible to reasonably use an EC7 compliant investigation technique we have adopted a practical technique to obtain indicative soil parameters and any interpretation is based upon our engineering experience and relevant published information.

The Report is issued on the condition that Soil Consultants Ltd will under no circumstances be liable for any loss arising directly or indirectly from ground conditions between the exploratory points which differ from those identified during our investigation. In addition, Soil Consultants Ltd will not be liable for any loss arising directly or indirectly from any opinion given on the possible configuration of strata between the exploratory points, below the maximum depth of the investigation or where site conditions have changed since the exploratory work; such opinions, where given, are for guidance only and no liability can be accepted as to their accuracy. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in using this Report.

Comments made relating to groundwater or ground-gas are based upon observations made during our investigation unless otherwise stated. Groundwater and ground-gas conditions may vary with time from those reported due to factors such as seasonal effects, atmospheric effects and and/or tidal conditions. We recommend that if monitoring installations have been included as part of our investigation, continued monitoring should be carried out to maximise the information gained.

Specific geotechnical features/hazards such as (but not limited to) areas of root-related desiccation and dissolution features in chalk/soluble rock can exist in discrete localised areas - there can be no certainty that any or all of such features/hazards have been located, sampled or identified. Where a risk is identified the designer should provide appropriate contingencies to mitigate the risk through additional exploratory work and/or an engineered solution.

Where a specific risk of ground dissolution features has been identified in our Report (anything above a 'low' risk rating), reference should be made to the local building control to establish whether there are any specific local requirements for foundation design and appropriate allowances should be incorporated into the design. If such a risk assessment was not within the scope of our investigation and where it is deemed that the ground sequence may give rise to such a risk (for example near-surface chalk strata) it is recommended that an appropriate assessment should be undertaken prior to design of foundations.

Where spread foundations are used, we recommend that all excavations are inspected and approved by suitably experienced personnel; appropriate inspection records should be kept. This should also apply to any structures which are in direct contact with the soil where the soil could have a detrimental effect on performance or integrity of the structure.

Ground contamination often exists in small discrete areas - there can be no certainty that any or all such areas have been located, sampled or identified.

The findings and opinions conveyed in this Report may be based on information from a variety of sources such as previous desk studies, investigations or chemical analyses. Soil Consultants Limited cannot and does not provide any guarantee as to the authenticity, accuracy or reliability of such information from third parties; such information has not been independently verified unless stated in our Report. No liability will be accepted for changes to the ground and groundwater conditions which occur post investigation.

Our Report is written in the context of an agreed scope of work between Soil Consultants Ltd and the Client and should not be used in any different context. In light of additional information becoming available, improved practices and changes in legislation, amendment or re-interpretation of the assessment or the Report in part or in whole may be necessary after its original publication.

Unless otherwise stated our investigation does not include an arboricultural survey, asbestos survey, ecological survey or flood risk assessment and these should be deemed to be outside the scope of our investigation.

We will identify tree and plant species if possible, but a suitably qualified arboriculturalist/botanist should be consulted to provide definitive identification.

Where reference to 'topsoil' is made, this should be construed as any turf (if present) plus any obvious organic-rich/humic layer of soil beneath, which may or may not contain roots/rootlets. Unless otherwise requested, we do not provide a detailed description, undertake sampling/testing for classification purposes or provide a specific classification. The thickness of the 'topsoil' identified on our exploratory hole records is indicative only and should not be used for detailed volume or site strip calculations.

STANDARD TERMS OF APPOINTMENT OF SOIL CONSULTANTS LTD FOR GEOTECHNICAL SERVICES

1 Unless previously withdrawn, our offer remains valid for a period of sixty days from date of offer. If an instruction is given after the sixty days we reserve the right to reasonably adjust any cost associated with the project to reflect any variance on the original offer. In placing an instruction to proceed with exploratory work, whether directly from the Client or Client's representative, the Client is deemed to have accepted our Terms of Appointment.

2 Our offer is on the basis that free, unhindered access and working conditions are available and that the investigation can be completed in one visit, if applicable. Delays beyond our control will incur additional charges. If additional works outside our offer are required to facilitate the investigation these will be advised and any costs will be passed on to the Client.

3 In our quotation we will provide an estimate of any mobilisation period following an instruction to proceed. This estimate will be accurate at the time of quotation, but it should be noted that the mobilisation period may vary at a later date due to factors such as sub-contractor availability and workload.

4 In commissioning this work, the Client has a responsibility for the health, safety and welfare of operatives invited to undertake work on their site. The Client shall indemnify us in respect of any failure to fulfil their obligations in connection with all relevant and current Health and Safety Regulations.

5 The methods of investigation used have been chosen taking into account the constraints of the site including but not limited to access, space and budgetary limitations. Where it has not been possible to reasonably use an EC7 compliant investigation technique, or where a non-compliant technique has been specified, we will adopt practical and appropriate techniques to obtain indicative soil parameters.

6 Unless otherwise stated, our Report should be construed as being a Ground Investigation Report (GIR) as defined in BS EN1997-2. Our Report is not intended to be and should not be viewed or treated as a Geotechnical Design Report (GDR) as defined in BS EN1997-2. Any interpretation which is provided is for guidance only and must not be regarded as design or design recommendation.

7 Where excavation is required as part of the exploratory work, the Client shall provide drawings or plans showing accurate and complete locations of all underground services and structures. In performing our service, we shall take reasonable precautions to avoid damage to underground services or structures. We will not be responsible for any damage caused to underground services or structures and will not be liable for any claims for damage, expenses arising or losses unless the location of all underground services or structures are accurately shown on drawings and those plans have been provided to us in good time prior to commencement of the exploratory work. Risk to the Client can be further reduced by undertaking a scan of the site using a specialist underground scanning service which would be intended to identify traceable services at shallow depth.

8 With some sites, especially those in certain areas of London and other large towns and cities, there may be a risk of unexploded ordnance (UXO) being present. Unless otherwise stated our offer is on the basis that the Client or their representative provides a preliminary UXO risk assessment for the site. It should be noted that if the site is deemed to be in an area of risk then further measures will be required. These would normally comprise either a more detailed risk assessment and/or specialist site attendance by an EOD engineer. These measures can be commissioned either by the Client or Soil Consultants Ltd. If the Client requires, we would be pleased to obtain a preliminary risk assessment at cost+10%.

9 The Client will supply a site plan (to a rational scale), an indication of the scope and type of the proposed development and an indication of any relevant structural loading information.

10 Should the Client terminate the contract after instruction, we reserve the right to recover costs associated to work carried out between the time of instruction and the point of termination. Cancellation fees, and material costs shall be charged at cost plus 20% (+VAT). Engineer/technician time shall be charged at £95+VAT per hour and principal consultant/director time shall be charged at £125+VAT per hour.

11 The Report is issued on the condition that Soil Consultants Ltd will under no circumstances be liable for any loss arising directly or indirectly from ground conditions between the exploratory points which differ from those identified during the investigation. In addition Soil Consultants Ltd will not be liable for any loss arising directly or indirectly from any opinion given on the possible configuration of strata both between the exploratory points and/or below the maximum depth of the investigation; such opinions, where given, are for guidance only and no liability can be accepted as to their accuracy. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in using this Report.

12 If and when instructed, an agreed number of contamination tests will be carried out to give an outline assessment of potential contaminants. In some circumstances it may be necessary to recommend further monitoring, contamination testing and assessment and the scope of this work would be agreed with the Client. Notwithstanding this additional scope, local regulatory authorities may have specific requirements which need to be addressed. Unless otherwise agreed or stated our reporting will constitute neither a Quantitative Risk Assessment nor a Remediation Statement or Strategy.

13 Our reports are counter-checked by one of our suitably qualified and experienced engineers/geologists.

14 Notwithstanding anything to the contrary contained in these terms, our liability under or in connection with these terms whether in contract or in tort, in negligence, for breach of statutory duty or otherwise (other than in respect of personal injury or death) shall not exceed the sum equivalent to ten times our contract fee or £100,000 whichever is less in the aggregate for geotechnical and environmental matters unless otherwise agreed.

15 Without prejudice to any other exclusion or limitation of liability, damages, loss, expense or costs our liability for any claim or claims under this agreement be further limited to such sum as it would be just and equitable for us to pay having regard to the extent of our responsibility for the loss or damage giving rise to such claim or claims ("the loss and damage") and on the assumptions that:

(a) All other consultants, contractors, sub-contractors, project managers or advisers engaged in connection with the Project have provided contractual undertakings to the Client on terms no less onerous than those set out in the original contracts in respect of the carrying out of their obligations in connection with the Project; and

(b) There are no exclusions of or limitations of liability nor joint insurance or co-insurance provisions between the Client and any other party referred to in this clause and any such other party who is responsible to any extent for the loss and damage is contractually liable to the Client for the loss and damage; and

(c) All such other consultants, contractors, sub-contractors, project managers or advisers have paid to the Client such proportion of the loss or damage which it would be just and equitable for them to pay having regard to the extent of their responsibility for the loss and damage.

16 Further and notwithstanding anything to the contrary contained in this agreement and without prejudice to any provision in this agreement whereby liability is excluded or limited to a lesser amount, our liability under or in connection with this agreement whether in contract or in tort, in negligence, for breach of statutory duty or otherwise for any claim shall not exceed the amount, if any, recoverable by us by way of indemnity against the claim in question under professional indemnity insurance taken out by us and in force at the time that the claims or (if earlier) circumstances that may give rise to the claim is or are reported to the insurers in question. The limitation shall not apply if no such amount is recoverable due to us having been in breach of our obligations or the terms of any insurance maintained in accordance therewith or having failed to report any such claim or circumstances to the Insurers in question timeously.

17 Whilst our investigation may include asbestos screening/quantification on selected samples, this must not be deemed to constitute a full asbestos survey or be taken as sufficient to definitively identify the presence or quantity of asbestos within or on the ground. We will not accept responsibility if asbestos is encountered during any subsequent construction or development works and in placing a contract with us the Client accepts this condition. Where the fabric of a building is to be disturbed, the Client shall provide an appropriate asbestos survey to us prior

to exploratory work and make adequate provision to allow the implementation of sufficient and appropriate protective/remedial measures for the work to progress safely.

18 Where our report refers to 'topsoil', this should be construed as any turf (if present) plus any obvious organic rich/humic layer of soil beneath, which may or may not contain roots/rootlets. Unless otherwise requested, we do not provide a detailed description, undertake sampling/testing for classification purposes or provide a specific classification. The thickness of the 'topsoil' identified on our exploratory hole records is indicative only and should not be used for detailed volume or site strip calculations; if this type of classification is required, this should be identified to us at an early stage and the method of sampling, testing and classification agreed.

19 The Client agrees that they shall not bring any claim personally against any director/employee of Soil Consultants Ltd or consultant to us in respect of loss or damage suffered by the Client arising out of this contract.

20 Our appointment shall be under simple agreement and our liability under this contract or in tort shall be for a period of six years from date of appointment.

21 Our reports are non-assignable and are prepared for the benefit of the Client. No reliance can be assumed by others without written agreement from Soil Consultants Ltd. We will provide a letter of reliance at our discretion and this will be subject to payment of our fee, which will be 10% of contract value, subject to a minimum fee of £1,250 plus VAT. The terms of our letter of reliance are non-negotiable and the beneficiary should be aware that the information shall only apply to the scheme for which the report was originally produced and the original rights and benefits will apply.

22 A VAT invoice (at current rate) will be presented in respect of the work undertaken. Payment of our account is to be made within twenty-eight days of issue of our invoice unless otherwise agreed. On no account shall payment be on a 'pay-when-paid' basis. The information contained within our report remains the property of Soil Consultants Ltd and no reliance may be assumed by any party with an interest in the project until payment has been received in full. After one calendar month interest shall be chargeable at 10% above the Bank of England Rate and compensation claimed in accordance with 'Late Payments of Commercial Debts (Interest) Act 1998 and subsequent revisions. If the debt is referred to a debt collection agency then we have the right to recover associated fees under the terms of our contract.

APPENDIX A

Fieldwork, in-situ testing and monitoring

- Foreword
- Rotary auger borehole records
- Dynamic sampler borehole records
- Standard Penetration Test results
- SPT hammer calibration certificates
- Trial pit records
- Shallow sample summary
- Groundwater and gas monitoring results

Laboratory testing

- Index property testing
- Plasticity chart
- Unconsolidated undrained triaxial test results (QUT)
- Particle size distribution tests

Ground profiles

- Plot of SPT 'N' value and undrained cohesion versus level
- Cross section through boreholes

Contamination and chemical testing

- Foreword
- General soil suite
- PCB congeners suite
- WAC test results
- Sulphate/pH suite

Plans, drawings & photographs

- Site photographs
- Site survey drawing
- Tree Constraints Plan (GHA Trees Arboricultural Consultancy drawing Rev A, dated June 2021)
- Proposed development plans and sections
- Site Plan
- Location Plan

FOREWORD FOR ROTARY AUGER DRILLING - GUIDANCE NOTES

GENERAL

The borehole records are compiled from the driller's description of the strata encountered, an examination of the samples by our geotechnical engineer and the results of in-situ and laboratory tests. Based on these data, the report presents an opinion on the configuration of strata within the site. However, such reasonable assumptions are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes.

BORING METHODS

The rotary auger technique uses a solid-stems auger of 125mm diameter. The auger comprises 1m segments which are drilled into the ground and withdrawn in 1m increments for sampling. Casing can be utilised as required. The technique allows the ground conditions to be reasonably well established although disturbance of the ground is inevitable, particularly some "softening" of the upper zone of clay immediately beneath a granular soil. The presence of thin layers of different soils within a stratum may not always be detected.

GROUND WATER

The depth at which ground water was struck is entered on the borehole records. However, this observation may not indicate the true water level at that time. Due to the speed of boring and the relatively small diameter of the borehole, natural ground water may be present at a depth higher than the water strike. Moreover, ground water levels are subject to variations caused by changes in the local drainage conditions and by seasonal effects. When a moderate inflow of water does take place, boring is suspended for at least 10 minutes to enable a more accurate short-term water level to be achieved. An estimate of the rate of inflow is also given. This is a relative term and serves only as a guide to the probable flow of water into an excavation. Further observations of the water level made during the progress of the borehole are shown including end of shift and overnight readings and the depth at which water was sealed off by the borehole casing, if applicable.

SAMPLES

Undisturbed samples of predominantly cohesive soils are obtained using a 100mm diameter open-drive sampler. In granular soils, disturbed bulk samples are taken and placed in polythene bags. Small jar samples are taken at frequent intervals in all soils for subsequent visual examination. Where ground water is encountered in sufficient quantity, a sample of the ground water can also be taken.

IN-SITU STANDARD PENETRATION TESTS (SPT)

This test is performed in accordance with the procedure given in BS EN ISO 22476-3:2005. The individual blow count record for each test is given on a separate table. The 'N' value is normally the number of blows to achieve a penetration of 0.3m following a seating distance of 0.15m and is quoted at the mid-depth of the test zone. However if a change of stratum occurs within the test zone then a revised 'N' value can be calculated to assess one layer in particular. In hard strata full penetration may not be obtained. The presence of groundwater and particularly Where groundwater can affect the test and the measured values may not represent the true in-situ density of the soil.

Site & Location:	**Denville Hall,** **62 Duck's Hill Road, Northwood, Hillingdon HA6 2SB**	Borehole No:	**BH01**
Client:	**Denville Hall 2012 Ltd**	Coordinates: 508145E, 191330N	Sheet 1 of 2
Engineer:	**London Structures Lab**	Ground Level: +69.20mOD	Report No: 10767/JW

Progress & Observations	Samples & Tests Type	Depth (m)	Field Test Results	Strata Depth (m)	Strata Level (m)	Legend	Strata Descriptions	Backfill / Installation
BH commenced: 23 August 2022 BH dia: 125mm				0.20	69.00		Grass over dark brown TOPSOIL	
	D	0.25					MADE GROUND: brown/orangish brown slightly clayey sandy gravel of flint and rare brick fragments	
	PID	0.25	0.0					
	D	0.50						
	PID	0.50	0.0					
	D	0.75						
	PID	0.75	0.0					
	D	1.00		1.00	68.20		Soft, becoming firm to very stiff, light brown/reddish brown/ greyish brown mottled slightly sandy slightly gravelly silty CLAY with occasional fine roots. Gravel is subangular to subrounded fine to medium flint gravel	
Hand excavated inspection pit to 1.20m	PID	1.00	0.0					
	D	1.20						
	SPT/S	1.20	N=6					
	PID	1.20	0.0					
	D	1.85					*at 1.85m; occasional fine roots. Possibly desiccated to about 2.75m*	
Triaxial result = 304kPa	U	2.00						
	D	2.75		2.75	66.45		Stiff brown, mottled grey, slightly sandy silty CLAY with frequent pockets of extremely weak calcrete	
	D	3.00						
	SPT/S	3.00	N=15					
	D	3.75		3.75	65.45		Stiff dark reddish brown, mottled greyish blue, silty CLAY	
	D	4.00						
	SPT/S	4.00	N=23					
	D	4.75		4.75	64.45		Dense light grey clayey silty fine to medium SAND	
	D	5.00						
	SPT/S	5.00	N=35					
	D	6.00		6.00	63.20		Very dense greyish green slightly silty very sandy GRAVEL. Gravel is rounded fine to coarse flint	
	D	6.50						
	SPT/S	6.50	N>50*					
	D	7.50						
	D	8.00						
	SPT/C	8.00	N>50*					
	D	9.00		9.00	60.20		CHALK - recovered as off white weak chalk gravel in a matrix of silt sized communited material. Rare gravel sized flint fragments	
	D	9.50						
	SPT/S	9.50	N=13					
				10.00	59.20		Continued on next sheet	

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water ES = glass jar & plastic tub E = glass jar SPT/S = split spoon SPT/C = solid cone PP = Pocket Penetrometer [kg/cm²] HV = Hand Vane [kPa] PID = Photo Ionisation Detector [ppm - Isobutylene Equivalent, PhoCheck Tiger, 10.6eV lamp] * = full SPT penetration not achieved - see summary sheet

Borehole type: Rotary Auger

Remarks: a) approximate ground level from Midland Survey Ltd Utility and CCTV Drainage Survey (Ref: 41975_1, dated July 2022) and coordinates from online mapping data
b) 50mm ID standpipe installed to 5.0m

Borehole No: **BH01**

APPENDIX F
Asbestos Survey Report

SCANCROSS

ENVIRONMENTAL SERVICES LTD.

Unit 7b, Lupton Road
Thame, Oxon, OX9 3SE
Telephone: 01844 217727 Fax: 01844 217320
E mail: enquiries@scancross.com

REPORT NUMBER 13366/192

ASBESTOS SURVEY AT

Denville Hall, 62 Ducks Hill Road, Northwood, HA6 2SB

CARRIED OUT BY:	***Scancross Environmental Services Ltd***
COMMISIONED BY:	***Genevieve Hughes***
ON BEHALF OF:	***Change Project Consultancy The Smiths Building, 179 Great Portland St., Marylebone, London W1W 5PL***
SURVEY DATE:	***14th April 2021***
PREPARED BY:	***Jason Emerton***
SURVEY TYPE:	***Refurbishment Demolition***

Registration No. 1890293. VAT Registration No. 417 3100 94
Directors: M. R. Harris, V. M. Harris

Scancross Environmental Services Ltd is licensed for the treatment and removal of asbestos.

1.0 INTRODUCTION

Scancross Environmental Services Ltd were given an instruction to carry out an asbestos survey at the site detailed below.

The purpose of the survey was to identify asbestos materials that may be present within the buildings construction and fittings and which may be disturbed during the course of normal everyday activities, whether that be normal occupation and maintenance in the case of a Management Survey, or refurbishment, demolition or significant maintenance actvities for a Refurbishment/Pre-demolition Survey. Upon completion of the survey, this report, containing a complete Asbestos Asset Register was to be produced.

Sections one, and three to nine of this report discuss the methods employed to carry out the survey, and give a general breakdown of how the report was compiled. Section 1.1 contains general observations on the site and area covered in this survey, and section two provides an executive summary detailing the asbestos materials identified, or the absence thereof. The appendices give details of samples taken, asbestos materials identified at the site, and provide recommendations on remedial measures and monitoring. Photographs of the asbestos materials identified can also be found in the appendices, along with the Asset Register and Results of Analysis forms.

2.0 EXECUTIVE SUMMARY

Scancross (ES) Ltd were given an instruction by Change Project Consultancy to undertake an R & D Asbestos survey at Denville Hall, Ducks Hill road, Northwood. The Survey was carried out on 14th April 2021 by Jason Emerton

The inspections were carried out on a detached bungalow, three storey property converted into flats and a detached garage store.

The bungalow is constructed with brick and block elevations with as external sand and cement pebble render applied. The roof is formed from clay tiles. Fitted to roof edges and elevations are timber board soffits and fascias and plastic and metal rain water goods. A single cement cowl on the roof stack was visually inspected from the ground. Although no sample of the cowl was taken for safety reasons it should be presumed to contain asbestos until proven otherwise.

Internally the bungalow generally consists of concrete slab and timber board floors. Solid structural and partion walls and ceilings are finished with plaster materials. Loft space areas are formed from a timber frame with glass fibre insulation laid between the joists. Plastic water storage tanks have associated metal and plastic pipe work lagged with sectional foam and hessian sleeve insulation.
A single metal pipe run inspected within the loft space was sampled for signs of lagging residue but no asbestos was identified.

The Flats are constructed with brick and block elevations. The roof is formed from clay tiles. Fitted to roof edges and elevations are timber board soffits and fascias and plastic and metal rain water goods. Second floor dormer windows could not be accessed externally but it is presumed that the undercloak panels fitted beneath the dormer roof edges may contain asbestos and should be treated as so until proven otherwise.
A single cement cowl on the roof was visually inspected from the ground. Although no sample of the cowl was taken for safety reasons it should be presumed to contain asbestos until proven otherwise.

Internally the flats are generally formed from concrete slab and timber boards floors. Structural solid and partition walls are formed from plaster and plasterboard materials. Lath-n-plaster and plasterboard ceilings are then installed throughout.
The eaves spaces were accessed from hatches on the first and second floors which are formed from insulation board panels. A sample of the insulation board hatch panels was sampled for analysis but no asbestos was identified within the sample taken. The loft and eaves spaces are formed from a timber frame with glass fibre insulation laid between the joists. Metal pipework inspected was lagged with sectional foam insulation.
The kitchen floor area in the ground floor flat three has plastic tiles fitted that were sampled for analysis and were found to contain asbestos.
First floor balcony areas have concrete paving slabs laid to the floor, A sample of the paving slabs was taken for analysis but no asbestos was identified within the sample

taken.

The Garage store is constructed from brick walls and has a pitched clay tiled roof. Fitted along one side only on both the front and rear gable roof edges are cement sheet undercloak panels. A sample of the cement undercloak was taken for analysis and found to contain asbestos.
Redundant cement sheet were inspected to the floor at the rear of the garage. A sample of the cement sheets was taken for analysis and found to contain asbestos.

DETAILS OF ASBESTOS MATERIALS

Address: **Denville Hall, 62 Ducks Hill Road, Northwood, HA6 2SB**

Report Date: **21 April 2021**

Building: **Bungalow**

Sample No	Location	Type of material	Material Condition	Surface Treatment	Level of Access	Extent of material	Asbestos type	Material Score	Rating
SES / Xa	Exterior Roof, Chimney stack Moulded Cement Cowl	Moulded cement	Good	Bare	Low	No. x 1	STRONGLY PRESUMED ASBESTOS	5	**D**

Building: **Flats**

Sample No	Location	Type of material	Material Condition	Surface Treatment	Level of Access	Extent of material	Asbestos type	Material Score	Rating
SES / 02	Interior, Ground Floor, Flat 3 Kitchen Floor Plastic Tiles	Thermoplastic asbestos	Good	Glazed	Medium	7m2	CHRYSOTILE	2	**D**
SES / Xb	Exterior Rear Roof Moulded Cement Cowl	Moulded cement	Good	Bare	Low	No. x 1	STRONGLY PRESUMED ASBESTOS	5	**D**
SES / Xc	Exterior Rear Roof Dormer Bays Cement Sheet Undercloak	Insulation Board	Good	Bare	Low	3Lm x 2	STRONGLY PRESUMED ASBESTOS	7	**C**

Building: **Garage**

Sample No	Location	Type of material	Material Condition	Surface Treatment	Level of Access	Extent of material	Asbestos type	Material Score	Rating
SES / 05	Exterior Roof Edges Cement Sheet undercloak	Cement sheet	Good	Bare	Low	4 Lm x 2	CHRYSOTILE	3	**D**

SES / 06	Exterior Rear Elevation Cement sheets	Cement sheet	Fair	Bare	Medium	4 x Sheets (8m2)	CHRYSOTILE	4	**C**

3.0 ASBESTOS IDENTIFICATION ANALYSIS

There are three main types of asbestos, blue (Crocidolite), brown (Amosite) and white (Chrysotile). Each type of asbestos was used in the manufacture of a wide variety of products. Below we have listed the typical forms of asbestos bearing material.

3.1 Sprayed coatings

These are a mixture of hydrated asbestos cement and approximately 85% asbestos fibre. It was used for anti-condensation and accoustic control in buildings; decorative finishes and as fire protection for structural steel etc. Any of the three main types may be used for sprayed coatings but Amosite was the most common. Sprayed asbestos is sometimes found on ceilings and steelwork. It is very friable material and is likely to release fibres.

3.2 Thermal insulation

This term covers a wide range of materials including pipe sections, slabs, tape, paper, quilts, felts, blankets and plastered cement. Lagging may have a protective covering of cloth, tape, paper, metal or cement. Any asbestos type may be found in lagging. Quilts, mattresses and blankets may contain up to 100% asbestos.

Asbestos lagging was widely used in public buildings, factories and hospitals as pipe and plant insulation. Quilts are common on steam boilers. Asbestos rope was wound around pipework or used as gaskets. A small number of houses have “loose fill” asbestos loft or duct insulation. Asbestos has also been used as insulation between floors.

Lagging is susceptible to damage unless well coated due to leaks from pipes or boilers or during maintenance activities.

3.3 Asbestos insulating board

This has a density approx. 700kg/cu.m and contains about 16-40% asbestos mixed with hydrated Portland cement or calcium silicate. It is sometimes referred to as the trade name “Asbestolux”. Crocidolite was used in some insulating boards but they are generally formed from Amosite with a small amount of Chrysotile.

Asbestos boards were widely used as fire protection, thermal and accoustic insulation, resistance to moisture and as general building board. They are often found as ceiling tiles, firebreaks, infill panels, wall linings, bath panels, external canopies, porch linings, in lift shafts and in ducts.

Insulating board linings are found as cladding infill panels, oven linings and suspended floor systems. Asbestos insulating board can be very friable when damaged.

3.4 Asbestos cement

This has a density of approximately 1500kg/cu.m and contains about 10-15% asbestos. Crocidolite and Amosite have been used in asbestos cement products but Chrysotile is the most common type.

Asbestos cement is very common and has a wide variety of uses such as roofing, wall cladding, partitioning, decorative panels, bath panels, soffits, portable buildings, fire surrounds, cisterns and tanks, drains, sewer pipes, flue pipes, gutters, fencing, cable troughs and conduits, ventilators and ducts.

It is a very hard substance but may release fibres if abraded, sawn or if it has deteriorated or decomposed.

3.5 Bitumen and felts

Asbestos fibre may be found in roofing felts, flashing tapes, and damp proof courses. This is sometimes in the form of asbestos paper in bitumen matrix. These materials may become brittle with age but during normal use they do not present a hazard. Asbestos mixed with bitumen or bitumen re-inforced with asbestos paper was sometimes used as a coating for corrugated steel. This was used as roofing and wall cladding in warehouses and factories. The asbestos is firmly bound but may be released if the bitumen is burned off.

3.6 Flooring materials

Asbestos may be present in certain PVC and thermoplastic floor tiles and sheet material. Also, some types of PVC flooring have a backing of asbestos paper. Fibres bonded into the flooring may be released as the material wears.

3.7 Textured coatings and paints

Asbestos may be present in some textured coatings or paints. Fibres will be released if the coating is sanded or scraped dry.

3.8 Mastics, sealants and putties

Small amounts of asbestos may be present in mastics, waterproofing sealants, putties and adhesives to improve covering power and to prevent cracking and “slumping”.

4.0 SURVEY METHODOLOGY

4.1 Survey types

The object of the survey was to locate and quantify asbestos containing materials within the buildings. There are two types of survey method as defined in HSE HSG 264. They are defined as;

*Management survey

A management survey is the standard survey. Its purpose is to locate, as far as is reasonably practicable, the presence and extent of any suspect ACMs in the building which could be damaged or disturbed during normal occupancy, including foreseeable maintenance and installation, and to assess their condition.

Management surveys will often involve minor intrusive work and some disturbance. The extent of intrusion will vary between premises and depend on what is reasonably practicable for individual properties, ie it will depend on factors such as the type of building, the nature of construction, accessibility etc. A management survey should include an assessment of the condition of the various ACMs and their ability to release fibre into the air if they are disturbed in some way. This 'material assessment' will give a good initial guide to the priority for managing ACMs as it will identify the materials which will most readily release airborne fibres if they are disturbed

* Refurbishment and demolition surveys

A refurbishment and demolition survey is needed before any refurbishment or demolition work is carried out. This type of survey is used to locate and describe, as far as is reasonably practicable, all ACMs in the area where the refurbishment work will take place or in the whole building if demolition is planned. The survey will be fully intrusive and will involve destructive inspection, as necessary, to gain access to all areas, including those that may be difficult to reach. A refurbishment and demolition survey may also be required in other circumstances, eg when more intrusive maintenance and repair work will be carried out or for plant removal or dismantling.

Within the building where materials of this type were encountered, the Scancross consultant looked at all the accessible materials and carried out bulk sampling as necessary.

4.2 Bulk Sampling

Bulk sampling was designed to reflect the extent of any material and made allowance for any apparent change in a materials appearance or texture. It is often sufficient to obtain just a single sample from a large expanse of material, which is obviously uniform in construction (for example a large sheet of insulation board). In other cases several samples may have been required in only a small area (for example a section of pipe lagging which may have utilised different materials along its length).

Bulk samples were obtained using appropriate extraction tools and, where necessary suitable protective clothing and RPE were worn during the sampling exercise. All samples were double wrapped within impermeable plastic bags before being taken for subsequent analysis. Analysis of samples was undertaken using polarised light microscopy in conjunction with dispersion staining techniques in accordance with our documented in-house standards, HSE HSG264, and under full UKAS accreditation for such activities.

4.3 Scope

Any materials, which the attending consultant considered suspicious, were sampled and the offending material rendered as safe as possible until the outcome of sample analysis was known.

Where materials were obviously similar to those already encountered, further sampling was not necessarily carried out. The subsequent un-sampled materials were awarded an ‘X’ number to indicate the likelihood of an asbestos content. Where an ‘X’ number appears in this report followed by a number, the numbers alongside it denote the original sample number to which the material should be referenced, and which is considered to be a representative sample of the material. It should be assumed that results of analysis would be comparable. This approach is designed to avoid the taking of large numbers of similar samples or non-asbestos samples.

Where an ‘X’ sample is followed by a letter, this indicates a suspect material which has not been sampled for reasons of access or otherwise, but which the attending consultant believed may contain asbestos. In these instances, no representative samples have been obtained. Any such materials will be either 'PRESUMED' or ‘STRONGLY PRESUMED’ to contain asbestos, and will appear in the appendices of this report as such. Where materials have been 'Presumed' or ‘Strongly Presumed’ to contain asbestos, they shall be recorded as containing Crocidolite asbestos.

This survey report details samples positively identified as containing asbestos using Polarised Light Microscopy methods and analysed in a laboratory acrredited by UKAS. A full list of asbestos materials identified will be detailed within the asbestos asset register included with this report. It is the clients' responsibility to ensure that the recommendations detailed in this report are acted upon. Any category A or B materials will require immediate consideration. All materials identified as containing asbestos should be suitably labelled with asbestos warning signs or with an approved labelling system, which will identify the materials only to those persons to whom the information is relevant.

Any remedial works carried out on asbestos materials as a result of this report should be performed by an asbestos removal contractor licensed for such works by the HSE.

5.0 RISK ASSESSMENT

The duty-holder at a premises is required by law to assess and reduce to the lowest levels reasonably practicable the potential hazard for fibre release that any Asbestos Containing Materials (ACMs) represent. In order to comply with this duty, two separate assessments must be carried out.

The first assessment, known as a Material Assessment, should and has been carried out by ourselves during the course of the survey to ascertain the type and condition of the ACM. An additive algorithm is included within HSG 264 which gives clear guidance on the production of this assessment.

The second stage of the assessment, known as a Priority Assessment, is carried out by the duty-holder, and reflects their greater knowledge of the use of the building and the potential for disturbance to the material. Guidance on this section of the assessment can be found within the HSE publication HSG 227.

In addition to these basic assessments, we have included within this report a quick reference risk assessment carried out by ourselves, which is designed to give the client an immediate indication of the potential for fibre release upon receipt of the report and prior to carrying out their own Priority Assessment. This should only be used as an indicator, and the client should still endeavour to carry out their own Priority Assessment at the earliest opportunity.

5.1 Material Assessment

The four main parameters which will determine the amount of fibre release from an ACM when subject to standard disturbance are :-

- Product Type
- Extent of Deterioration
- Surface Treatment
- Asbestos Type

Each parameter is scored as :-

High	3
Medium	2
Low	1
Nil	0

The potential for fibre release is then calculated as follows :-

Potential risk	Score
High potential to release fibres	10 - 12
Medium potential to release fibres	7 - 9
Low potential to release fibres	5 - 6
Very low potential to release fibres	2 - 4
Non asbestos materials	0

5.1.1 Material assessment algorithm **

Sample variable	Score	Examples of scores (see notes for more detail)
Product type (or debris from product)	1	Asbestos-reinforced composites (plastics, resins, mastics, roofing felts, vinyl floor tiles, semi-rigid paints or decorative finishes, asbestos cement etc)
	2	Asbestos insulating board, millboard, Other low density insulation boards, asbestos textiles, gaskets, ropes and woven textiles, asbestos paper and felt.
	3	Thermal insulation (e.g. pipe and Boiler lagging), sprayed asbestos, loose asbestos, asbestos mattresses and packing.
Extent of damage/deterioration	0	Good condition: no visible damage
	1	Low damage: a few scratches or Surface marks; broken edges on boards, tiles etc.
	2	Medium damage: significant breakage of materials or several small areas where material has been damaged or is bare revealing loose asbestos fibres.
	3	High damage or de-lamination of materials, sprays and thermal insulation. Visible asbestos debris.

Surface Treatment	0	Composite materials containing asbestos: reinforced plastics, resins, vinyl tiles.
	1	Enclosed sprays and lagging, AIB (with exposed face painted or encapsulated), asbestos cement sheets etc.
	2	Unsealed AIB, or encapsulated lagging and sprays.
	3	Unsealed lagging and sprays.
Asbestos type	1	Chrysotile.
	2	Amphibole asbestos excluding Crocidolite.
	3	Crocidolite.

5.2 Priority Assessment

The priority assessment is designed to give a clearer indication of the likelihood of disturbance and exposure to the Asbestos Containing Materials (ACMs) identified at a premises, and is based on a working knowledge of the buildings use and activities. For this reason, it is usually compiled by the person responsible for health and safety at any given premises. The four main parameters assessed are:-

- Normal occupant activity
- Likelihood of disturbance
- Human exposure potential
- Maintenance activity

Assessment Factor	Score	Examples of score variables ***
Normal occupant activity		
Main type of activity in area	0	Rare disturbance activity (eg little used store room)
	1	Low disturbance activities (eg office type activity)
	2	Periodic disturbance (eg industrial or Vehicular activity which may contact ACMs)
	3	High levels of disturbance (eg Firedoor with asbestos insulating board sheet in constant use)
Secondary activities for area	As above	As above
Likelihood of disturbance		
Location	0	Outdoors
	1	Large rooms or well ventilated areas
	2	Rooms up to 100m2
	3	Confined spaces

Accessibility	0	Usually inaccessible or unlikely to be disturbed
	1	Occasionally likely to be disturbed
	2	Easily disturbed
	3	Routinely disturbed
Extent/amount	0	Small amounts or items (strings, Gaskets)
	1	<10m2 or 10Lm pipe run
	2	>10m2 to <50m2 or >10Lm to <50Lm pipe run
	3	>50m2 or >50Lm pipe run
Human exposure potential Number of occupants	0	None
	1	1 to 3
	2	4 to 10
	3	>10
Frequency of use of area	0	Infrequent
	1	Monthly
	2	Weekly
	3	Daily
Average time area is in use	0	<1 hour
	1	>1 to <3 hours
	2	>3 to <6 hours
	3	>6 hours

Maintenance activity

Type of maintenance activity	0	Minor disturbance (eg possibility of contact when gaining access)
	1	Low disturbance (eg changing light bulbs in asbestos insulting board ceiling)
	2	Medium disturbance (eg lifting one or two asbestos insulating board ceiling tiles to access a valve)
	3	High levels of disturbance (eg removing a number of asbestos insulating board ceiling tiles to replace a valve or for re-cabling)

6.0 RISK RATING

6.1 Categories

Our own quick reference risk assessment scheme operates under an additive algorithm which uses the material assessment scoring system in conjunction with three further categories which give an indication of the likelihood of disturbance and potential for significant fibre release. This is designed to supplement but not replace the clients own Priority Assessment. The supplementary categories are:-

- Position
- Accessibility
- Content
- Condition

The scoring for the supplementary categories are:-

Position:	Exterior	0 points
	Interior	1 point
	Heating system	2 points
	Air flow	3 points

Asbestos associated with heating creates a greater risk potential, as there is an increased likelihood of it being worked on or damaged. If asbestos is located within a direct air-flow, e.g. ventilation trunking, the risk increases. The risk from asbestos in the external environment is less than from asbestos within a building.

Accessibility:	Low	1 point
	Medium	2 points
	High	3 points

This is a subjective assessment and is based on the surveyors' knowledge of the use of the building. It takes into account the likelihood of a material being disturbed during maintenance, and the ease with which the material can be damaged or accessed during normal everyday activities.

Content:	Trace	1 point	0-5%
	Significant	2 points	5-50%
	Dominant	3 points	50-100%

The above quantities are subjective assessments which take into account the greater potential for fibre release from an ACM with a higher concentration of asbestos fibres within their matrix, and allow for a more informed risk assessment to be produced. They are recorded for that purpose only.

Condition:	None	0 points
	Minor	1 point
	Considerable	2 points
	Severe	3 points

This is opinionative and is based on the surveyors' observations of the level of damage to the material and subsequent potential for fibre release. It will take into account the type of material, the quality of any encapsulant applied, and whether debris was observed.

6.2 Ratings

Risk ratings are designed to give the duty-holder a quick reference guide to the potential for asbestos fibre release presented by any identified ACMs. The points awarded under the various headings in the risk assessment are totalled and the result is used to determine the rating – the higher the number of points, the greater the risk. The ratings should be interpreted as follows:-

Category A 14+ points

The materials identified as category A are those high priority materials which represent a significant and immediate danger to the buildings occupants and/or any persons who might be incidentally exposed. Materials within this category generally contain at least a significant amount of asbestos, are located in an area where airborne fibre release is likely to cause harm, and have not been maintained in the best condition. Removal of the offending material should be carried out at the earliest opportunity or the material should be made safe as soon as possible.

Category B 12-13 points

Category B materials represent a significant but not necessarily immediate danger to those persons likely to come into contact with them. There may be a variety of reasons why the materials have accumulated enough points to fall within this category but generally, they tend to be poorly located and in a relatively poor condition. Efforts should be made to render the material safe or carry out removal at the earliest opportunity. If the materials are not removed, a regular program of inspection should take place to ensure that the material is being maintained in good condition.

Category C 8-11 points

Materials within this category are of relatively low risk. It may be that they are located outside of harms way or that the nature of the material is such that it is unlikely to give rise to airborne asbestos fibre. Any materials within this category identified as being unsealed should have a suitable sealant applied and maintained. It is recommended that any situations within this category be inspected on at least a six monthly basis to

ascertain any change in circumstances, which may require a reassessment of risk.

Category D 1-7 points

Situations within this category are of the lowest priority and will include products in good condition located outside of harms way and the lower risk materials. The situation should be monitored on the basis of an annual inspection cycle to ascertain any change in category.

Category E 0 points

This will be all sampled materials within which no asbestos was identified during analysis.

6.3 Recommendations

Asbestos containing materials should not be disturbed. Measures should be put in place to prevent accidental exposure by staff, contractors or any other users of the building. Any planned disturbance to asbestos containing materials should only be carried out by a contractor licensed by the Health and Safety Executive (as per the Asbestos Licensing Regulations 1983) and giving the statutory notices to the Health and Safety Executive. All asbestos containing materials must be treated in accordance with the Control of Asbestos Regulations 2012 and, specifically, the asbestos containing materials that have been located within this building should be managed in accordance with Regulation 4 of the said regulations. This survey and report forms part of the compliance with Regulation 4, however, further active systems of management are required. Advice should be sought as to the implementation of Regulation 4. As a first step towards full compliance, we would recommend carrying out the priority risk assessment as detailed in section 5.2 of our report. This should be carried out by someone familiar with the use of the building (and, consequently, not by our surveyor). The score achieved for each material can then be set against the scoring table headed as 'potential risk' within the material condition assessment listed in section 5.1. The aim of this process is for the building manager to put all asbestos located within this report into an order of priority based on known risks. This will then include risks that are outside the knowledge of our surveyor.

7.0 LEGAL REQUIREMENTS

7.1 Duties of Employers

All work with asbestos containing materials is controlled under the Control of Asbestos Regulations (CAR) 2012. The object of these regulations, which are made under the Health & Safety at Work etc. Act 1974, is to minimise workers exposure to asbestos fibres in the workplace.

The Control of Asbestos Regulations (CAR) 2012 dictate that a duty-holder has to manage the asbestos risk within his non-domestic property.

**(1) In this regulation "the dutyholder" means -

(a) every person who has, by virtue of a contract or tenancy, an obligation of any extent in relation to the maintenance or repair of non-domestic premises or any means of access thereto or egress therefrom; or

(b) in relation to any part of non-domestic premises where there is no such contract or tenancy, every person who has, to any extent, control of that part of those non-domestic premises or any means of access thereto or egress therefrom,

and where there is more than one dutyholder, the relative contribution to be made by each such person in complying with the requirements of this regulation will be determined by the nature and extent of the maintenance and repair obligation owed by that person.

(2) Every person shall cooperate with the dutyholder so far as is necessary to enable the dutyholder to comply with his duties under this regulation.

(3) In order to enable him to manage the risk from asbestos in non-domestic premises, the dutyholder shall ensure that a suitable and sufficient assessment is carried out as to whether asbestos is or is liable to be present in the premises.

(4) In making the assessment -

(a) such steps as are reasonable in the circumstances shall be taken; and

(b) the condition of any asbestos which is, or has been assumed to be, present in the premises shall be considered.

(5) Without prejudice to the generality of paragraph (4), the dutyholder shall ensure that -

(a) account is taken of building plans or other relevant information and of the age of the premises; and

(b) an inspection is made of those parts of the premises which are reasonably accessible.

(6) The dutyholder shall ensure that the assessment is reviewed forthwith if -

(a) there is reason to suspect that the assessment is no longer valid; or

(b) there has been a significant change in the premises to which the assessment relates.

(7) The dutyholder shall ensure that the conclusions of the assessment and every review are recorded.

(8) Where the assessment shows that asbestos is or is liable to be present in any part of the premises the dutyholder shall ensure that -

(a) a determination of the risk from that asbestos is made;

(b) a written plan identifying those parts of the premises concerned is prepared; and

© the measures which are to be taken for managing the risk are specified in the written plan.

(9) The measures to be specified in the plan for managing the risk shall include adequate measures for -

(a) monitoring the condition of any asbestos or any substance containing or suspected of containing asbestos;

(b) ensuring any asbestos or any such substance is properly maintained or where necessary safely removed; and

© ensuring that information about the location and condition of any asbestos or any such substance is -

(i) provided to every person liable to disturb it, and

(ii) made available to the emergency services.

(10) The dutyholder shall ensure that -

(a) the plan is reviewed and revised at regular intervals, and forthwith if -

(i) there is reason to suspect that the plan is no longer valid, or

(ii) there has been a significant change in the premises to which the plan relates;

(b) the measures specified in the plan are implemented; and

© the measures taken to implement the plan are recorded.

(11) In this regulation, a reference to –

(a) "the assessment" is a reference to the assessment required by paragraph (3);

(b) "the premises" is a reference to the non-domestic premises referred to in paragraph (1); and

© "the plan" is a reference to the plan required by paragraph (8).

** Text taken directly from Control of Asbestos Regulations 2012

8.0 TERMS OF REFERNCE

Statutory Regulations and Approved Codes of Practice

Such regulations include but are not necessarily limited to the following:-

- Control of Asbestos Regulations 2012
- Health and Safety at Work Act 1974
- Deposit of Poisonous Wastes Act 1972
- Control of Pollution Act 1974
- Health and Safety Act 1981
- Construction (Design and Management) Regulations 2015
- L143 Work with materials containing asbestos ACOP
- L127 The management of asbestos in non-domestic premises ACOP
- L21 Management of Health and safety at Work Regulations 1999 ACOP
- HSG247 Asbestos: The licensed contractors' guide
- HSG189/2 Working with asbestos cement
- HSG210 Asbestos essentials task manual
- HSG264 Asbestos: The Survey Guide

9.0 LIMITS OF SURVEY

9.1 Disclaimer

Every effort has been made to identify all asbestos materials so far as was reasonably practical to do so within the scope of the survey and the attached report. Methods used to carry out the survey were agreed with the client prior to any works being commenced.

Survey techniques used involves trained and experienced surveyors using the combined approach with regard to visual examination and necessary bulk sampling. It is always possible after a survey that asbestos based materials of one sort or another may remain in the property or area covered by that survey, this could be due to various reasons:

•Asbestos materials existing within areas not specifically covered by this report and therefore outside the scope of the survey.

•Materials may be hidden or obscured by other items or cover finishes, e.g. paint, over boarding, disguising etc. Where this is the case then its detection will be impaired.

•Asbestos may well be hidden as part of the structure to a building and not visible until the structure is dismantled at a later date.

•Debris from previous asbestos removal projects may well be present in some areas; general asbestos debris does not form part of this survey however all good intentions are made for its discovery.

•Where an area has been previously stripped of asbestos (e.g. plant rooms, ducts etc) and new coverings added, it must be pointed out that asbestos removal techniques have improved steadily over the years since its introduction. Most notably would be the Control of Asbestos at Work Regulations 2012 or other similar subsequent Regulations laying down certain enforceable guidelines. Asbestos removal prior to this regulation would not be of today’s standard and therefore debris may be present below new coverings.

•This survey will detail all areas accessed and all samples taken; where an area is not covered by this survey it will be due to no access for one reason or another, e.g. working operatives, sensitive location or just simply no access. It may have been necessary for the limits of the surveyor’s authority to be confirmed prior to the survey.

•Access for the survey may be restricted for many reasons beyond our control such as height, inconvenience to others, immovable obstacles or confined space. Where electrical equipment is present and presumed in the way of the survey no access will be attempted until proof of its safe state is given. Our operatives have a duty of care under Health and Safety at Work etc Act 1974 for both themselves and others.

•In the building where asbestos has been located and it is clear that not all areas have been investigated, any material that is found to be suspicious and not detailed as part of the survey should be treated with caution and sampled accordingly.

•Certain materials contain asbestos to varying degrees and some may be less densely contaminated at certain locations (e.g. Artex). Where this is the case the sample taken may not be representative of the whole product throughout.

•Where a survey is carried out under the guidance of the owner of the property, or his representative, then the survey will be as per his instructions and guidance at that time.

•Scancross Environmental Services Limited cannot be held responsible for any damage caused as part of this survey carried out on your behalf. Due to the nature and necessity of sampling for asbestos some damage is unavoidable and will be limited to just that necessary for the taking of the sample.

Generally, for the purpose of this exercise sampling was destructive but stopped short of breaking into walls, floor ducts etc., and was confined to those accessible materials suspected by the surveyor of containing asbestos, or materials which the surveyor considered would probably be representative of others of similar appearance. This approach is designed to avoid the taking and analysis of large numbers of similar samples, or non-asbestos samples. Further, our report is given on the strict understanding that the land around and beneath the survey perimeter has not been tested for contamination or pollution. Testing for contaminated land is beyond the scope of this survey. Further, unless specifically stated, it should be assumed that no access was gained to any underfloor ducts or voids either within or without the borders of the survey area. Although every attempt was made to be thorough within the constraints of a limited sampling regime, we offer no guarantee that all asbestos has been identified in this report. Scancross Environmental Services Ltd will accept no responsibility for any asbestos not identified in this report, or the financial or other consequences of any such omissions.

9.2 Inaccessible areas

Although every attempt was made to access all areas of the site within the constraints of the agreed survey scope and parameters, it was not possible to gain access to certain areas. All such areas should be presumed to contain asbestos until proven otherwise.

For safety reasons, no live electrical boxes or equipment were inspected internally. Care should be taken when dismantling any electrical items as asbestos gaskets and flashguards are commonly found in such equipment.

As a matter of course, we do not sample bitumen materials such as damp proof courses, roofing felts and sink pads, and will not have done so unless specifically mentioned in the observations section and/or analysis sheets.

Unless specifically mentioned, no access was gained inside any firedoors. These doors can often contain asbestos materials, and care should be taken in their handling.

Offcuts of asbestos insulation board or cement blocks can often be used as a packing material behind door frames, window frames, skirting boards, under timber floors etc. These installations can be sporadic, and are not easily identified during the course of a survey. Care should be taken during the deconstruction of any such items, and any suspicious materials should be investigated.

Underfloor ducts and/or voids were accessed only where specifically mentioned in the Observations (1.1) section of this report.

Access to the roofs of buildings is only gained when safe to do so. It should be assumed that no access was gained unless specifically mentioned in the Observations section of this report.

RESULTS OF ANALYSIS

Denville Hall, 62 Ducks Hill Road, Northwood, HA6 2SB

Job No: 13366/192

Survey date: 14th April 2021

SES / Xa	Exterior	Roof, Chimney stack	Moulded Cement Cowl	STRONGLY PRESUMED ASBESTOS Significant
SES / 01	Loft Space	Single Pipe Run	Pipe Residue	No asbestos detected
SES / 02	Interior, Ground Floor, Flat 3	Kitchen Floor	Plastic Tiles	CHRYSOTILE Significant
SES / 03	Exterior	Balcony Floor	Concrete Slabs	No asbestos detected
SES / 04	Interior, Flats 5 & 6	Eaves Hatch Panels	Insulation Boards	No asbestos detected
SES / 05	Exterior	Roof Edges	Cement Sheet undercloak	CHRYSOTILE Significant
SES / 06	Exterior	Rear Elevation	Cement sheets	CHRYSOTILE Significant
SES / Xb	Exterior	Rear Roof	Moulded Cement Cowl	STRONGLY PRESUMED ASBESTOS Significant
SES / Xc	Exterior	Rear Roof Dormer Bays	Cement Sheet Undercloak	STRONGLY PRESUMED ASBESTOS Significant

Asbestos Asset Register

Denville Hall, 62 Ducks Hill Road, Northwood, HA6 2SB

Sample No	Building	Area	Location	Installation	Content	Type of material	Condition	Priority
SES / Xa	Bungalow	Exterior	Roof, Chimney stack	Moulded Cement Cowl	Significant	Moulded cement	Good	D

General remarks: The moulded cement cowl is installed to the roof top chimney stack. The cowl should be removed by a competent contractor prior to any removal works.

Remedial measures: **Remove**

Extent: No. x 1

Material Assessment score **5**

SES / 02	Flats	Interior, Ground Floor, Flat 3	Kitchen Floor	Plastic Tiles	Significant	Thermoplastic asbestos	Good	D

General remarks: The plastic floor tiles are laid to the kitchen floor area within flat 3. The tiles should be removed by a competent contractor prior to any works commencing.

Remedial measures: **Remove**

Extent: 7m2

Material Assessment score **2**

SES / 05	Garage	Exterior	Roof Edges	Cement Sheet undercloak	Significant	Cement sheet	Good	D

General remarks: The cement undercloak is fitted beneath the roofing tiles on one side of the pitch on both the front and rear gable ends. The cement sheets should be removed by a competent contractor prior to any works commencing.

Remedial measures: **Remove**

Extent: 4 Lm x 2

Material Assessment score **3**

SES / 06	Garage	Exterior	Rear Elevation	Cement sheets	Significant	Cement sheet	Fair	**C**

General remarks: The redundant cement sheets are store externally to the rear of the garage. The cement sheets should be removed by a competent contractor prior to any works commencing.

Remedial measures:	**Extent:**	**Material Assessment score**
Remove	4 x Sheets (8m2)	**4**

SES / Xb	Flats	Exterior	Rear Roof	Moulded Cement Cowl	Significant	Moulded cement	Good	**D**

General remarks: The moulded cement cowl is installed to the roof. The cowl should be removed by a competent contractor prior to any removal works.

Remedial measures:	**Extent:**	**Material Assessment score**
Remove	No. x 1	**5**

SES / Xc	Flats	Exterior	Rear Roof Dormer Bays	Cement Sheet Undercloak	Significant	Insulation Board	Good	**C**

General remarks: The Undercloak panels installed beneath the roof tiles of the bay dormers could not be reached safely for sampling. It should be presumed and treated as though the undercloak panels contain asbestos until proven otherwise.

Remedial measures:	**Extent:**	**Material Assessment score**
Remove	3Lm x 2	**7**

Building	Job no	Sample No
Bungalow	13366/192	SES / Xa

Area	Condition
Exterior	Good

Location	Type of material
Roof, Chimney stack	Moulded cement

Installation	Content
Moulded Cement Cowl	STRONGLY PRESUMED ASBESTOS
	Significant

Material Assessment Score	5	RISK CATEGORY	D

Photo

General remarks

The moulded cement cowl is installed to the roof top chimney stack. The cowl should be removed by a competent contractor prior to any removal works.

Building	Job no	Sample No
Flats	13366/192	SES / 02

Area	Condition
Interior, Ground Floor, Flat 3	Good

Location	Type of material
Kitchen Floor	Thermoplastic asbestos

Installation	Content
Plastic Tiles	CHRYSOTILE
	Significant

Material Assessment Score	2	RISK CATEGORY	D

Photo

General remarks

The plastic floor tiles are laid to the kitchen floor area within flat 3. The tiles should be removed by a competent contractor prior to any works commencing.

Building	Job no	Sample No
Garage	13366/192	SES / 05

Area	Condition
Exterior	Good

Location	Type of material
Roof Edges	Cement sheet

Installation	Content
Cement Sheet undercloak	CHRYSOTILE
	Significant

Material Assessment Score	3	RISK CATEGORY	D

Photo

General remarks

The cement undercloak is fitted beneath the roofing tiles on one side of the pitch on both the front and rear gable ends. The cement sheets should be removed by a competent contractor prior to any works commencing.

Building	Job no	Sample No
Garage	13366/192	SES / 06

Area	Condition
Exterior	Fair

Location	Type of material
Rear Elevation	Cement sheet

Installation	Content
Cement sheets	CHRYSOTILE
	Significant

Material Assessment Score	4	RISK CATEGORY	C

Photo

General remarks

The redundant cement sheets are store externally to the rear of the garage. The cement sheets should be removed by a competent contractor prior to any works commencing.

Building	Job no	Sample No
Flats	13366/192	SES / Xb

Area	Condition
Exterior	Good

Location	Type of material
Rear Roof	Moulded cement

Installation	Content
Moulded Cement Cowl	STRONGLY PRESUMED ASBESTOS
	Significant

Material Assessment Score	5	RISK CATEGORY	D

Photo

General remarks

The moulded cement cowl is installed to the roof. The cowl should be removed by a competent contractor prior to any removal works.

Building	Job no	Sample No
Flats	13366/192	SES / Xc

Area	Condition
Exterior	Good

Location	Type of material
Rear Roof Dormer Bays	Insulation Board

Installation	Content
Cement Sheet Undercloak	STRONGLY PRESUMED ASBESTOS
	Significant

Material Assessment Score	7	RISK CATEGORY	C

Photo

General remarks

The Undercloak panels installed beneath the roof tiles of the bay dormers could not be reached safely for sampling. It should be presumed and treated as though the undercloak panels contain asbestos until proven otherwise.

NON-ASBESTOS REGISTER

SES / 01	Bungalow	Loft Space	Single Pipe Run	Pipe Residue	No asbestos detected

Remarks:
The older single pipe run that runs through the middle of the loft space was sampled for signs of pipe residue but no asbestos was identified within the sample taken.

SES / 03	Flats	Exterior	Balcony Floor	Concrete Slabs	No asbestos detected

Remarks:
The concrete slabs are laid to the first floor balcony areas. The slabs were sampled for analysis but no asbestos was identified within the sample taken.

SES / 04	Flats	Interior, Flats 5 & 6	Eaves Hatch Panels	Insulation Boards	No asbestos detected

Remarks:
The insulation boards form the eaves access hatch panels to the first floor flat 5 bathroom and second floor flat 6 bedroom and bathroom areas. A sample of the insulation hatch panels was taken for analysis but no asbestos was identified within the

APPENDIX G
Bat Emergence Survey

The Ecology Co-op
ENVIRONMENTAL CONSULTANTS
Unit 4, Langham Stables, Langham Lane, Lodsworth, Petworth, West Sussex, GU28 9BU.
Tel: 01798 861 800 - E-Mail: info@ecologyco-op.co.uk - Web: www.ecologyco-op.co.uk

Bat Emergence Survey Report

Site Name

Denville Hall, Northwood

Client

Denville Hall Development Ltd

Issue Date

16th July 2026

Author

Holly Waters

Project No: P11114

The Ecology Co-operation Ltd
Registered Office: Unit 4, Langham Stables, Langham Lane, Lodsworth, West Sussex, GU28 9BU
Company number: 8905527

Document Control

Issue No	Author	Reviewer	Issue Date	Additions/alterations	Notes
Original	**Holly Waters** BSc (Hons), MSc, ACIEEM	**Kate Priestman** MCIEEM, CEnv	16.07.26	N/A	

Conditions of use

This report has been prepared by The Ecology Co-operation Ltd, with all reasonable skill, care and diligence within the terms of the Contract with the client. This report only becomes the property of the client once payment for it has been received in full.

We disclaim responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client, and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

About the Author

This report has been prepared by Holly Waters, a Senior Ecologist at The Ecology Co-op, with 5 years' experience. She has a Level 2 bat survey licence and has prepared numerous reports for protected species. As an Associate member of the Chartered Institute for Ecology and Environmental Management (CIEEM), she is bound by their code of professional conduct.

About the Reviewer

This report has been reviewed by Kate Priestman, who is a Principal Ecologist with over twenty years' experience. Kate has undertaken extensive survey work and reporting, encompassing a breadth of deliverables, and prepared European Protected Species licences for numerous schemes. As a Full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and a Chartered Environmentalist (CEnv), she is bound by CIEEM's code of professional conduct.

Report Summary

Purpose	The Ecology Co-op was commissioned by Denville Hall Development Ltd to undertake bat emergence surveys at Denville Hall, further to a proposal to demolish the Flats, Garage, and the Bungalow.
Context	The site currently comprises a care home, alongside several unused buildings: the Flats, the Garage and the Bungalow. Previous surveys of the site identified bat potential associated with the roof void and roof tiles on the Flats. Based on this assessment and in line with Bat Conservation Trust Guidelines, two bat emergence survey visits were carried out between May and June 2026 to determine the presence of roosting bats and evaluate the conservation importance of the site for bats. The purpose of this survey work was to update previous surveys related to a potential application for a European Protected Species Licence.
Key findings	No bats were seen to emerge from the Flats on either survey. It was noted that the site is utilised by common and soprano pipistrelle bats for foraging purposes, and that brown long-eared, *Myotis sp.* and noctule bats commute across the site. Two birds were identified to be nesting on the south-eastern corner of the roof of the dormer window on the first survey.
Interpretation	These surveys indicate that there are no bat roosts present within this building.
Recommendations	As no bat roosts have been identified, it will not be possible to obtain a European Protected Species (EPS) licence for the demolition of the Flats. Therefore, the condition should be updated to reflect this, and precautionary measures of works followed instead, for both bats and birds.

CONTENTS PAGE

1 INTRODUCTION

1.1 Background

The owners of Denville Hall intend to submit a planning application for a proposed development that involves the demolition of the Flats, the Garage and the Bungalow on site to make space to construct new buildings.

The full address for the site is Denville Hall, 62 Duck's Hill Road, Northwood, London HA6 2SB. The central National Grid Reference for this site is TQ 0811 9134.

Surveys of the site were previously undertaken in 2018[1] and 2022[2][3], in which 5 bat droppings and several insect wings were identified within the void of the Flats, leading to a proposal that the void is utilised as a feeding roost. However, no bats were noted to emerge from or re-enter any of the buildings on any of the emergence or re-entry surveys. DNA analysis of the bat droppings was not undertaken. Due to the length of time between the previous surveys and the proposed start date, it was considered necessary to resurvey the buildings proposed for demolition. An updated bat scoping survey was undertaken in May 2026[4], during which the Flats were assessed as having moderate suitability to support roosting bats, while the Garage and Bungalow were assessed as having negligible suitability to support roosting bats.

1.2 Purpose of the Report

In accordance with recommendations, bat emergence surveys were carried out by The Ecology Co-op between May and June 2026 led by Holly Waters, an Associate member of the Chartered Institute of Ecology and Environmental Management and licensed bat surveyor.

The purpose of this survey work was to determine presence of roosting bats and where necessary prescribe further surveys and/or appropriate mitigation advice to inform the planning application for the proposed development at the site.

This survey and report were carried out at the request of Denville Hall Development Ltd.

2 LEGAL PROTECTION

Details of legislation and legal protection afforded to all species of British bats are given in Appendix 1.

The results of this survey will be used to determine the need for an appropriate mitigation strategy to ensure compliance with UK and EU wildlife legislation.

---

[1] The Ecology Consultancy (2018) Preliminary Roost Assessment *Denville Hall, Northwood, HA6 2SB*
[2] MMEcology (2022) Preliminary Ecological Appraisal & Preliminary Roost Assessment *Denville Hall Care Home, 62 Duck's Hill Road, Northwood*
[3] MMEcology (2022) Nocturnal Emergence/Dawn Re-Entry Bat Surveys *Denville Hall Care Home, 62 Duck's Hill Road, Northwood*
[4] The Ecology Co-op (2026) Bat Scoping Assessment *Denville Hall, Northwood*

3 METHODOLOGY

Two emergence survey were undertaken of the Flats, on the 26th May and 23rd June 2026, using the methodology set out in the best practice guidelines prepared by the Bat Conservation Trust.

The surveys focused upon the hanging tiles covering the dormer window, and both aspects of the roof, using two surveyors and three thermal/night-vision cameras positioned according to Figure 1. From these positions, surveyors could see all features potentially suitable for roosting bats that were identified during the initial bat scoping survey.

The surveyors recorded any bat activity on or around the potential roosting entry/exit features identified during the scoping survey, using full spectrum handheld bat detectors to identify species through call frequencies. The bat calls were logged and recorded as sonograms for later confirmation of species where necessary.

The following equipment was used to support this survey:

- 3 x Echometer Touch 2 Pro detectors with Apple recording devices
- 2 x Pixfra XA613 thermal cameras paired with a surveyor
- 1 x Nightfox Nova night-vision camera paired with an Echometer Touch detector and Apple recording device and supported by infra-red torches.

Figure 1. An aerial image of the site, showing the positions of surveyors (red dots) and night-vision cameras (orange dots). Images produced courtesy of Google maps (map data ©2026 Google).

3.1 Limitations to Emergence Surveys

In accordance with best practice guidelines, each survey visit was undertaken during the peak period in bat activity and during good weather conditions. The results presented here are therefore considered to be an accurate representation of the general use of the property by roosting bats.

Nevertheless, bats can use roosting features intermittently throughout the year and may be present in larger or smaller numbers depending on their breeding cycle, weather conditions, and in response to disturbance. These surveys record the emergence of bats at the time of the survey visits and therefore only provide a snapshot of bat roosting activity at the site at that time. Bats may be present at other times and the results should therefore be viewed with caution.

4 RESULTS

4.1 Bat Emergence Surveys

4.1.1 Survey Conditions

The dates, times, weather conditions, temperatures and personnel for each survey visit are presented in Table 1 below:

Table 1. Details of surveys undertaken, timings weather conditions and personnel.

Date	Survey start time/end time	Temperature (°C), weather conditions throughout survey	Surveyors
26/05/26	Start time: 20:33 Sunset: 21:03 End time: 22:33	Max/min temp: 28–24. 0% cloud cover and light air (BF1), dry.	Holly Waters Josh McIlroy
23/06/26	Start time: 21:04 Sunset: 21:24 End time: 22:54	Max/min temp: 26–23. 0% cloud cover and still (BF0), dry.	Holly Waters Harry Jacobs

4.1.2 Bat Emergence Results

The following descriptions summarise bat activity and emergence from the building for each survey visit.

- 26th May 2026

  No emergences were recorded from the building.

  General bat activity across the site was moderate throughout the survey. The first bat recorded was a commuting common pipistrelle *Pipistrellus pipistrellus*. Both common and soprano pipistrelle *Pipistrellus pygmaeus* bats were recorded foraging around the building. Occasional passes by brown long-eared *Plecotus auritus* and noctule *Nyctalus noctule* were also recorded. Two birds (unidentified species) were recorded leaving a nest at the south-eastern corner of the roof of the dormer window.

- 23rd June 2026

  No emergences were recorded from the building.

  Bat activity was moderate again throughout this survey. Intermittent commuting and foraging was

recorded by common pipistrelle and soprano pipistrelle bats. Occasional passes by noctule, *Myotis sp.*, and brown long-eared bats were also recorded.

5 IMPACT ASSESSMENT AND MITIGATION RECOMMENDATIONS

5.1 Interpretation of Findings

No bats were seen to emerge from or enter the Flats on either of the recent surveys or previous surveys; this suggests that there are no bat roosts present within this building.

5.2 Precautionary Approach

As no bats have been identified emerging from or entering roosts on any of the surveys, and no new bat droppings were identified within the loft void, it is considered highly unlikely that the features identified in the bat scoping survey are regularly used by roosting bats. However, the highly transitory nature of many bat species means that it is not possible to completely dismiss this possibility as the potentially suitable features may be used infrequently. As a precautionary measure, the roof and hanging tiles on the building should be subject to removal by hand prior to the demolition of the buildings. If at any point bats, or significant evidence of bats (such as fresh accumulations of droppings) are found, works must halt and an ecologist must be contacted.

5.3 Breeding Birds

The proposal to demolish the building will result in the loss of a bird's nest identified on the south-eastern corner of the dormer window. Demolition of this building will therefore need to be timed outside of the nesting bird season, avoiding March – August inclusive, unless the area is first searched by a suitably qualified ecologist and no active nests are found. If an active nest is found, works must be postponed until the young have fledged.

To compensate for this loss, a replacement nesting opportunity must be incorporated into the new building, through addition of a bird box. This should be installed at a minimum height of 3.5m above the ground, out of view of direct sunlight, with clear unobstructed access to the entrance.

5.4 Conclusions

As no bat roosts have been identified within the Flats, no EPS licence will be required for the works. Instead, the building must be subject to precautionary methods of works for demolition. While previous reports state that a feeding roost is present within the void, an EPS licence cannot be applied for without sufficient evidence. The lack of bat emergences across multiple surveys in multiple years suggests that this was not a roost, and with no DNA analysis of droppings, it therefore must be concluded that a bat roost is not present.

As an EPS licence cannot be gained, the planning condition should be amended to a requirement to follow precautionary measures of works for the demolition of the surveyed buildings at Denville Hall.

Should you need any further advice on the information provided above, please do not hesitate to contact The Ecology Co-op.

APPENDIX 1 – LEGISLATION AND POLICY

All species of British bat are fully protected under the Wildlife and Countryside Act 1981 as amended through inclusion in Schedule V. All bat species in the UK are also included in Schedule II of the Habitats Regulations 2017 which transpose Annex II of the Council Directive 92/43/EEC 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora ("EC Habitats Directive") which defines European protected species of animals.

Bat species are afforded further protection by the Natural Environment and Rural Communities Act 2006.

Under the above legislation it is an offence to:

• kill, injure or take an individual;
• possess any part of an individual either alive or dead;
• intentionally or recklessly damage, destroy or obstruct access to any place or structure used by these species for shelter, rest, protection or breeding;
• intentionally or recklessly disturb these species whilst using any place of shelter or protection; or
• deliberate disturbance in such a way as to be likely to impair their ability to:
- survive, to breed or reproduce, or to rear or nurture their young; or
- in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- to affect significantly the local distribution or abundance of the species to which they belong;
• keep (possess), transport, sell or exchange, or offer for sale or exchange, any live or dead bat, or any part of, or anything derived from a bat.

It is also an offence to set and use articles capable of catching, injuring or killing bats (for example a trap or poison), or knowingly cause or permit such an action. In the case all species of British bat there is also protection under Schedule 6 of The Wildlife and Countryside Act 1981 (as amended) relating specifically to trapping and direct pursuit of these species.

The Habitats Directive and Habitats Regulations provide for the derogation from these prohibitions for specific reasons provided certain conditions are met. An EPS licensing regime allows operations that would otherwise be unlawful acts to be carried out lawfully. In England, Natural England is the licensing Authority and, in order to grant a license, ensures that three statutory conditions (sometimes referred to as the 'three derogation tests') are met:

- a licence can be granted for the purposes of "preserving public health or safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment" (Regulation 53 (2) (e);
- a licence can only be granted if "there are no satisfactory alternatives" to the proposed action;
- a licence shall not be granted unless the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

A bat roost is defined as "any structure or place, which any wild bat uses for shelter or protection." Bats tend to re-use the same roosts; therefore, legal opinion is guided by recent case law precedents, that a roost is protected whether or not the bats are present at the time. This can include all summer roosts, used for breeding, resting or sheltering and all winter roosts used for hibernating.

APPENDIX 2 – DARKEST POINTS

Figure 1. Darkest points from the camera on the northern aspect, on the 18th May 2026 (left) and 23rd June 2026 (right).

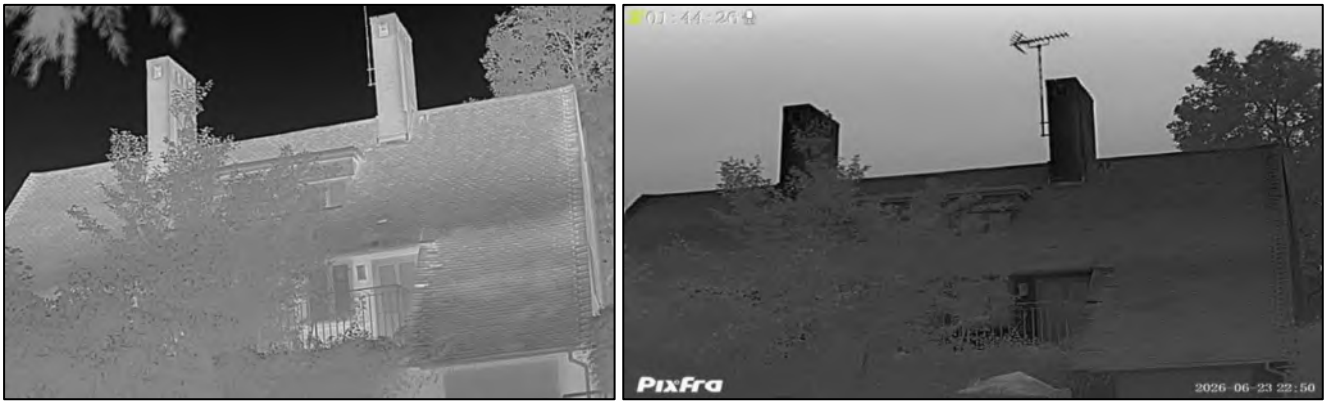


Figure 2. Darkest points from the camera on the southern aspect, on the 18th May 2026 (left) and 23rd June 2026 (right).

Figure 3. Darkest points from the camera on the south-western corner, on the 18th May 2026 (left) and 23rd June 2026 (right).

APPENDIX 3 – EXAMPLES OF REPLACEMENT BAT ROOSTING FEATURES

Figure 1. Left to right, the 2F, 2FN and the 1FS bat boxes produced by Schwegler. These and other brands are available at many on-line wildlife stores. These are constructed of 'woodcrete' (a mixture of cement and woodchip) and are designed to be durable and replicate the stable thermal properties of trees and buildings. They may be attached to trees or buildings.

Figure 2. Examples of integral bespoke bat roosting features that may be incorporated into buildings during construction/renovation. From left to right: an example of bat access tile into loft space; the 2FR bat tube; and an example of 2FR bat tubes installed into a house wall in a series of three. Other brands and designs are available.

APPENDIX 4 – REDUCING IMPACTS OF ARTIFICIAL LIGHT

Bright external lighting can have a detrimental impact upon foraging and commuting bat flight paths, but more importantly can also cause bats to remain in their roosts for longer. Artificial lighting can also cause significant impacts to other nocturnal species, most notably moths and other nocturnal insects. It can also result in disruption of the circadian rhythms of birds, reducing their fitness.

Guidelines issued by the Bat Conservation Trust[5] should be referred to when designing the lighting scheme. Note that lighting designs in very sensitive areas should be created with consultation from an ecologist and using up-to-date bat activity data where possible. The guidance contains techniques that can be used on all sites, whether a small domestic project or larger mixed-use, commercial or infrastructure development. This includes the following measures:

Avoid lighting key habitats and features altogether

There is no legal duty requiring any place to be lit. British Standards and other policy documents allow for deviation from their own guidance where there are significant ecological/environmental reasons for doing so. It is acknowledged that in certain situations lighting is critical in maintaining safety, such as some industrial sites with 24-hour operation; however, in the public realm, while lighting can increase the perception of safety and security, measurable benefits can be subjective. Consequently, lighting design should be flexible and be able to fully consider the presence of protected species.

Apply mitigation methods to reduce lighting to agreed limits in other sensitive locations – lighting design considerations

Where bat habitats and features are considered to be of lower importance or sensitivity to illumination, the need to provide lighting may outweigh the needs of bats. Consequently, a balance between a reduced lighting level appropriate to the ecological importance of each feature and species, and the lighting objectives for that area will need to be achieved. The following are techniques which have been successfully used on projects and are often used in combination for best results:

- dark buffers, illuminance limits and zonation;
- sensitive site configuration, whereby the location, orientation and height of newly built structures and hard standing can have a considerable impact on light spill;
- consideration of the design of the light and fittings, whereby the spread of light is minimised ensuring that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required. Consideration should be given to the height of lighting columns. It should be noted that a lower mounting height is not always better. A lower mounting height can create more light-spill or require more columns. Column height should be carefully considered to balance task and mitigation measures. Consider no lighting solutions where possible such as white lining, good signage, and LED cats eyes. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times;

[5] Bat Conservation Trust and Institute for Lighting Professionals (2023) Guidance note 8. Bats and Artificial Lighting. https://www.theilp.org.uk/documents/guidance-note-8-bats-and-artificial-lighting/

- screening, whereby light spill can be successfully screened through soft landscaping and the installation of walls, fences and bunding;
- glazing treatments, whereby glazing should be restricted or redesigned wherever the ecologist and lighting professional determine there is a likely significant effect upon key bat habitat and features;
- creation of alternative valuable bat habitat on site, whereby additional or alternative bat flightpaths, commuting habitat or foraging habitat could result in appropriate compensation for any such habitat being lost to the development;
- dimming and part-night lighting. Depending on the pattern of bat activity across the key features identified on site it may be appropriate for an element of on-site lighting to be controlled either diurnally, seasonally or according to human activity. A control management system can be used to dim (typically to 25% or less) or turn off groups of lights when not in use.

Demonstrate compliance with illuminance limits and buffers

- *Design and pre-planning phase*; it may be necessary to demonstrate that the proposed lighting will comply with any agreed light-limitation or screening measures set as a result of your ecologist's recommendations and evaluation. This is especially likely to be requested if planning permission is required.
- *Baseline and post-completion light monitoring surveys*; baseline, pre-development lighting surveys may be useful where existing on or off-site lighting is suspected to be acting on key habitats and features and so may prevent the agreed or modelled illuminance limits being achieved.
- *Post-construction/operational phase compliance-checking;* as a condition of planning, post-completion lighting surveys by a suitably qualified person should be undertaken and a report produced for the local planning authority to confirm compliance. Any form of non-compliance must be clearly reported, and remedial measures outlined. Ongoing monitoring may be necessary, especially for systems with automated lighting/dimming or physical screening solutions.

Lighting Fixture Specifications

The Bat Conservation Trust recommends the following specifications for lighting on developments to prevent disturbance:

- lighting spectra: peak wavelength >550nm
- colour temperature: <2700k (warm)
- reduction in light intensity
- minimal UV emitted
- upward light ratio of 0% and good optical control.

Further reading:

Buglife (2011) A review of the impact of artificial light on invertebrates.

Royal Commission on Environmental Pollution (2009) Artificial light in the environment. HMSO, London. Available at: https://www.gov.uk/government/publications/artificial-light-in-the-environment

Rich, C., Longcore, T., Eds. (2005) Ecological Consequences of Artificial Night Lighting. Island Press. ISBN 9781559631297.

CPRE (2014) Shedding Light: A survey of local authority approaches to lighting in England. Available at: http://www.cpre.org.uk/resources/countryside/dark-skies/item/3608-shedding-light

Planning Practice Guidance guidance (2014) When is light pollution relevant to planning? Available at: https://www.gov.uk/guidance/light-pollution

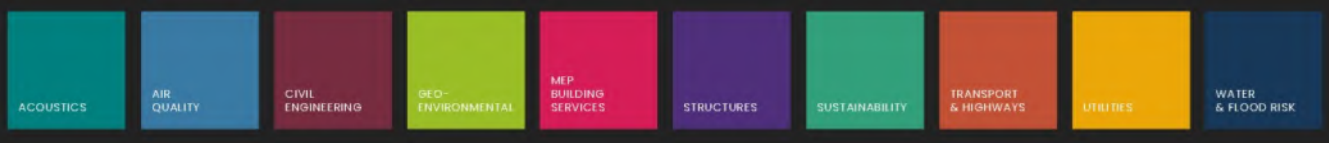
Institution of Lighting Professionals (2021) Guidance Notes for the Reduction of Obtrusive Light GN01:2011. Available at: https://www.theilp.org.uk/resources/free-resources/

Voigt, C.C., Azam, C., Dekker, J., Ferguson, J., Fritze, M., Gazaryan, S., Hölker, F., Jones, G., Leader, N., Lewanzik, D. and Limpens, H., 2018. *Guidelines for consideration of bats in lighting projects*. Unep/Eurobats. Available at: https://cdn.bats.org.uk/uploads/pdf/Resources/EUROBATSguidelines8_lightpollution.pdf?v=1542109376

Denville Hall Development Limited

DENVILLE HALL, NORTHWOOD

Demolition and Construction Environmental Management Plan



Independent, multidisciplinary engineering and environmental consultants

Norwich | London | Chelmsford | Glasgow | Milton Keynes

create

visit us at **createce.co.uk** or call us on **01603 877010**