Castledine Environmental

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

Proposed Conversion of Commercial Floorspace (Charitable Services Offices) to Residential Use (Class MA)

on the site of

Unit No.28, Hawthorne Court, Ryefield Crescent, Northwood HA6 1LJ

Date: March 2022

Status:	Final Report
Reference:	3246D P1 Hamways Ltd - Northwood
Date:	18/03/2022

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EXECUTIVE SUMMARY

The site is currently occupied by vacant, former office previously in use for a charitable company and has been since at least circa.2001. Historically, the site was unoccupied field prior to being developed with the building seen today, subsequently being shown as an engineering works and 'works' until circa.2001, following which the site has been both vacant and in use as office space.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** level of risk with respect to soil contamination and a **LOW** to **MODERATE** level of risk with respect to hazardous ground vapours.

It is recommended that further investigation in line with Section 11.0 be planned and carried out on site.

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

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1.0 QUALITY ASSURANCE

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

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

For and on behalf of Castledine Environmental

Kevin Castledine

(Director)

2.0 LIMITATIONS

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

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

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

3.0 INTRODUCTION

Castledine Environmental have been appointed by Hamways Ltd to undertake a Phase 1 Desk study on a site at Unit No.28, Hawthorne Court, Ryefield Crescent, Northwood, London HA6 1LJ.

4.0 SCOPE

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

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- Part C1 of the building regulations
- Support of a Planning Application

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

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

The objectives of the report are:-

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

5.0 SITE DESCRIPTION

The site is located in Northwood, London at National Grid Reference: 510352,190177 and is approximately 0.03ha in area.

The site is irregular in shape and orientated slightly north west to south east. The site forms part of a larger building, itself located in an urbanised area. The site is directly bounded by adjacent commercial units within the same building to the east and west, Ryefield Crescent access road to the south with housing beyond and a railway line and station platform with further housing beyond to the north.

The site interior comprises a commercial property previously in use for former charitable office spaces. Structural support stanchions (acrows) were seen throughout the unit. Access to the unit was provided via a large, double garage door on the southern face of Hawthorne Court, with the doors then located behind security shuttering. The interior of the premises comprises an initial large room upon entering the site, with a triangular room to the rear of this and extending to the north western boundary of site. Additional, smaller rooms were located off this triangular room and extending to the northern boundary of site. The flooring throughout the unit was noted to be concrete or carpet atop concrete, with little to no cracking or jointing seen. Water pooling was noted in areas, likely originating from rain water seeping through the ceiling. Storage of old timber and furniture was noted within the unit.

No significant sources of contamination were noted on the site walkover and topographically, the site is level.

Photos of the site are present in Appendix D

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed. The most pertinent information is summarised in the following sections. Additional geological and hydrological data was obtained from the British Geological Survey. A copy is presented in Appendix A.

6.1 HYDROLOGICAL

6.1.1 AQUIFER

6.1.1.1 SUPERFICIAL GEOLOGY

None recorded on or within 250m of site.

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	133	SE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

None recorded within 250m of site.

6.1.3 SOURCE PROTECTION ZONE

The site is located within a Type 2 ‘Outer Catchment’ Source Protection Zone (SPZ). Source protection zones define the sensitivity of an area around a potable abstraction site to contamination.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

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

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records an unnamed, surface level watercourse located 132m east and 170m south east of site.

6.1.6 DISCHARGE CONSENTS

None recorded within 250m of site.

6.2 PERMITTED PROCESSES

The Groundsure report records an active Part B Permit related to the unloading of petrol into storage located 96m south west of site and a historical Part B Permits located 106m south west of site and related to petrol vapour recovery.

6.3 POLLUTION INCIDENTS

The Groundsure report records 4 No. pollution incidents located within 250m of site, with 2 No. located 201m north east and 2 No. located 210m west. The incidents to the north east are dated 18/03/2002 and 15/04/2003 and related to general biodegradable food and drink wastes with a significant impact to water and air qualities and no impact to land; and the incidents located to the west related to sewage materials (grey waters) with a minor impact to water quality and no impact to land or air qualities.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 250m of site.

6.5 WASTE

6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)

None recorded within 250m of site.

6.5.2 LANDFILL SITES

None recorded within 250m of site.

6.6 HAZARDOUS SUBSTANCES

None recorded within 250m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the London Greenbelt located 89m south, 334m north west and 884m and 938m north east of site. The Groundsure report also records an area located 931m south west of site and named Ruislip Woods as an area of Special Scientific Interest (SSSI), a National Nature Reserves (NNR) and an area of Designated Ancient Woodland. No further sensitive land usages are recorded within 1000m of site.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2022" obtained from http://www.bgs.ac.uk/data/mapViewers/home.html under the Open Government Licence

6.8.1 SUPERFICIAL DEPOSITS

Both BGS geological mapping and the Groundsure report record no superficial geological deposits located on or within 250m of site.

6.8.2 BEDROCK DEPOSITS

Both BGS geological mapping Groundsure report record bedrock geology of The London Clay Formation underlying site and located 166m south of site and comprising a bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand.

The Groundsure report also records the Lambeth Group located 133m south east of site and comprising a vertically and laterally variable sequence of clays, some of which are silty or sand with some sands and gravels with minor limestones, lignite's and occasional sandstones and conglomerates.

6.8.3 BEDROCK PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of bedrock geology (London Clay Formation) is recorded as 'moderate' and the minimum permeability as 'very low' and facilitated by mixed flow mechanisms.

This is a qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

6.8.4 ARTIFICIAL GROUND

BGS geological mapping records no artificial deposits located on or within 250m of site.

6.8.5 BGS ESTIMATED URBAN SOIL CHEMISTRY

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 No. urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km2).

The Groundsure report records arsenic & bioaccessible arsenic, lead & bioaccessible lead, cadmium, chromium, copper, nickel and tin at background concentrations of 16mg/kg & 2.8mg/kg, 143mg/kg & 98mg/kg, 0.7mg/kg, 82mg/kg, 51mg/kg, 27mg/kg and 12mg/kg, respectively. Assuming a worst case GAC (generic acceptance threshold) of 1% SOM (soil organic matter), none of the recordings are above the generic acceptance thresholds.

6.8.6 COAL MINING

The site is not located in a coal mining reporting area.

6.8.7 SURFACE MINING / NONE-COAL MINING

ID	Distance [m]	Direction	Land Usage	Year of Mapping
A	13	N	Cuttings	1913
B	15	NE	Cuttings	1911
B	15	NE	Cuttings	1897
A	17	N	Cuttings	1911
A	17	N	Cuttings	1894
2	107	E	Cuttings	1935
B	131	NW	Cuttings	1913
B	131	NW	Cuttings	1938
B	137	NW	Cuttings	1935
B	140	NW	Cuttings	1911
B	143	NW	Cuttings	1959
B	148	NW	Cuttings	1894
B	232	NW	Cuttings	1992
B	232	NW	Cuttings	1974
B	232	NW	Cuttings	1968

6.8.8 RADON

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

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following

6.9.1 GOOGLE EARTH

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

Date	Description
December 1945	The site and surrounding areas generally resemble that seen in the present-day; with the site occupied by a building which forms a larger building in a triangular shape, a railway line immediately north of site and residential areas to the south, north beyond the railway line, east and west.
September 1999	The site is now clearly shown as occupied by the structure seen in the present-day. A large building has been erected approx.124m west of site and a petrol station is now located approx.100m south west of site.
December 2003	No discernible change on site nor site relevant change to the surrounding areas.
June 2005	No discernible change on site nor site relevant change to the surrounding areas.
December 2006	No discernible change on site nor site relevant change to the surrounding areas.
June 2010	No discernible change on site nor site relevant change to the surrounding areas.
March 2011	No discernible change on site nor site relevant change to the surrounding areas.
March 2012	No discernible change on site nor site relevant change to the surrounding areas.
April 2013	No discernible change on site nor site relevant change to the surrounding areas.
February 2014	No discernible change on site nor site relevant change to the surrounding areas.

Date	Description
June 2015	No discernible change on site nor site relevant change to the surrounding areas.
April 2017	No discernible change on site nor site relevant change to the surrounding areas.
May 2018	No discernible change on site nor site relevant change to the surrounding areas.
June 2019	No discernible change on site nor site relevant change to the surrounding areas.
March 2020	No discernible change on site nor site relevant change to the surrounding areas.
March 2021	No discernible change on site nor site relevant change to the surrounding areas.

6.9.2 GOOGLE STREET VIEW

Google Street View imagery is dated September of 2020 with the site viewed off Ryefield Crescent and facing north. Only the shuttered site access can be seen, with the remainder of site obscured by the building itself.

6.10 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment, found in the appendices.

Map	Onsite	Offsite
OS County Series: 1864-1865, 1:2,500 & 1:10,560	The site is shown as unoccupied field.	The surrounding areas at this time are predominantly agricultural field. Notable features include small ponds located approx.105 north and 95m east of stie and marshland located approx.20m south of site.
OS County Series: 1883, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
OS County Series: 1896, 1:2,500	No discernible change on site.	A railway line has been erected approx.10m north east of site and in a NW to SE orientation, with cuttings located approx..3m north extending NW and 107m east and extending SW. The pond formerly located to the east of site has been removed as part of the railway development.
OS County Series: 1895-1897, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1894-1899, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1911, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1911-1913, 1:2,500 & 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1920, 1;10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1935, 1:2,500 & 1:10,560	No discernible change on site.	The surrounding areas have now seen a great deal of change since circa.1920, with the area immediately beyond the railway line north now fully occupied by residential areas in the form of terraced housing, with further terraced housing located to the west of site beyond the roadside (present-day location of road). The former marshy area to the south of site is now an allotments gardens (approx.45m south – persistent until the present-day).
OS County Series: 1938, 1:10,560	No discernible change on site.	Further housing has been erected immediately south of site.

Map	Onsite	Offsite
Provisional: 1955-1960, 1:10,560	The site has now been developed and is part of the larger, triangular shaped building that is seen in the present-day.	Housing immediately south is now shown as detached housing with gardens, as see in present-day. Areas to the north, north east and north west, west, south east and south west of site have seen further terraced developments.
National Grid: 1965, 1:1,250	The site is now marked as 'Hawthorne Court – Engineering works'	A clinic is marked in the western extent of the building in which the site is located. A garage is now located approx.70m south west of site. Larger-scale mapping now shows the mainline railway to the north of site with additional tracks laid and Northwood Hills Station (which has been extended and enlarged from the former siding) to the north west of site.
National Grid: 1966, 1;2,500	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1965-1968, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1974-1976, 1:10,000	No discernible change on site.	Piggeries are marked approx.260m south of site.
National Grid: 1986-1990, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1992, 1:1,250 & 1:10,000	Site is now marked as 'works'.	The piggeries to the south of site adjacent to the allotments are no longer present.
National Grid: 2001, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
Landline: 2003, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2010, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2022, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.

6.11 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
A	0	On site	Works	Unspecified works or factories	Industrial features
A	36	W	Ferndown Motor Service	Vehicle repair, servicing and testing	Repair and servicing
B	104	SW	Tesco Petrol Station	Petrol and fuel station	Road and rail
1	114	NW	Northwood Hills	Underground network stations	Publish transport, stations and infrastructure
C	132	W	Vara Consulting Engineers Ltd	Structural engineers	Engineering services
C	132	W	Hi Tech IME Europe Ltd	General construction supplies	Industrial products
C	132	W	Alpha1Machinery Ltd	Industrial repairs and servicing	Repair and servicing
2	180	NW	Cartridge Works Northwood Ltd	Printing related machinery	Industrial products
3	183	NW	DCL	Dental and medical laboratories	Health practitioners and establishments
4	218	SW	Electricity substation	Electrical features	Infrastructure and facilities
5	232	NW	Unique Bedrooms Direct	Furniture	Consumer products
6	235	NE	Electricity substation	Electrical features	Infrastructure and facilities
7	241	NE	Soundzgood	Electronic equipment	Industrial products
8	248	N	Eggfree Cake Box	Baking and confectionary	Foodstuffs

6.12 PETROL AND FUEL SITES

The Groundsure report records an active Esso fuel station located 103m south west and an obsolete fuel station located 113m south west.

6.13 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

6.14 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
A	13	N	Cuttings	1911-1913
B	15	NE	Cuttings	1897
B	15	NE	Cuttings	1911
A	17	NN	Cuttings	1894
C	64	SW	Garage	1968
A	92	NW	Railway station	1935
A	92	NW	Railway station	1992
A	92	NW	Railway station	1986-1974
A	93	NW	Railway station	1959
1	107	E	Cuttings	1935
B	131	NW	Cuttings	1911-1992
B	131	NW	Cuttings	1935-1938
B	148	NW	Cuttings	1894

6.15 HISTORICAL TANK DATABASE

None recorded within 250m of site.

6.16 HISTORICAL ENERGY FACILITIES

ID	Distance(m)	Direction	Use	Date
2	217	SW	Electricity substation	1989
3	228	NE	Electricity substation	1973-1992

6.17 HISTORICAL GARAGE DATABASE

ID	Distance(m)	Direction	Use	Date
C	62	SW	Garage	1964
C	63	SW	Garage	1965
C	63	SW	Garage	1989

7.0 POLLUTANT LINKAGE ASSESSMENT

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is

considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential on and off-site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

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

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

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

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Development of the site and usage as engineering works

7.1.2 OFFSITE

- Adjacent mainline railway (immediately north circa.1895 to present-day)
- Cuttings (approx.15m NE and 107m E)

7.2 PATHWAYS

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

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

7.3 RECEPTORS

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

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

8.0 CONCEPTUAL SITE MODEL

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

8.1 PRELIMINARY CONCEPTUAL SITE MODEL

8.1.1 SOIL CONTAMINATION

The site is currently occupied by a vacant, former office unit. Historically, the site was unoccupied field prior to being developed with the building seen today and subsequently being used as an engineering works and 'works'. Following this, the site was obtained by lease from Temporary US Aid Charity in 2020 and was both vacant and used as office space until recently. Whilst the site usage and surrounding developments (mainline railway) is likely to have had some impact on shallow site soils, no soft-landscaping is present nor proposed and the entirety of site is occupied by building footprint and hardsurfacing in the form of significant concrete flooring; as such, the relevant pollutant linkages on site related to soil contamination will be effectively severed.

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

No significant sources of ground gas or vapour generation identified and the site is located in a predominantly low permeability area, thus inhibiting lateral migration. The sites historical usages as an engineering works and historical 'works' may have involved the storage and usage of fuels, oils and lubricants and as such, there is a potential for VOC contamination in residual shallow site soils. It is recommended that this is investigated further.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils	Direct Ingestion & Direct Contact	Site Workers	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons, considered usage and adherence to HSE regulations would mitigate this risk to **LOW**.
Contaminated Soils	Inhalation of Dust	Site Workers	Li	Md	M	
Contaminated Soils	Direct Ingestion & Direct Contact	End Users	Ul	Md	L	No soft-landscaping is present nor is any proposed, thus the relevant pollutant linkages arising from soil contamination here are severed. Recommend a Watching Brief (inline with Appendix E) be applied during site works.
Contaminated Soils	Inhalation of Dust	End Users	Ul	Md	L	
Contaminated Soils	Direct Ingestion	Flora and Fauna	Ul	Md	L	
Contaminated Soils	Vertical and lateral migration	Controlled Waters	Ul	Md	L	
Contaminated Soils	Direct contact	Services	Ul	Md	L	
Ground Gases (Methane and CO_2)	Vertical and lateral migration	End Users & Building Envelope	Ul	Md	L	No significant sources of potential ground gas generation identified; site is located in predominantly low permeability area, thus inhibiting lateral and vertical migration.
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope	Lw	Md	M/L	Sites historical usage may have impacted shallow site soils with VOC's, recommend investigation of soils below present concrete flooring.
Radon	Vertical and lateral migration	End Users & Building Envelope	Ul	Md	L	Site is not in a Radon Affected Area.

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

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

TABLE 2. RISK CLASSIFICATION MATRIX

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

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

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

TABLE 3. CLASSIFICATION OF RISK

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

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

9.0 ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **LOW** level of risk with respect to soil contamination and a **LOW** to **MODERATE** level of risk with respect to hazardous ground vapours. .

It is recommended that further investigation in line with Section 11.0 be planned and carried out on site.

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

10.0 SUMMARY OF RISKS

10.1.1 SOIL CONTAMINATION

Historically, the site was unoccupied field from circa. 1864-1865 through to circa.1955-1960 when the site was developed with the building seen in the present-day. The site is then labelled as part of an engineering works before being labelled as an 'unspecified' works by 1992. Following this, the site has been both vacant and in use as office space for a charitable company, being leased as such since circa.2020. The site then changes little on either historical mapping or contemporary satellite imagery. No significant sources of offsite contamination have been identified capable of adversely impacting the proposed development, with no soft-landscaping present or proposed, thus effectively severing the relevant pollutant linkage from soil contamination on site.

10.1.2 GROUND GASSES AND VAPOURS

No significant sources of ground gas or vapour generation identified and the site is located in a predominantly low permeability area, thus inhibiting lateral migration. The sites historical usages as an engineering works and unspecified 'works' may have involved the storage and usage of fuels and oils and as such, there is a potential for VOC contamination in residual shallow site soils. As such, it is recommended that a Phase 2 Intrusive Site Survey is planned and carried out on site.

11.0 RECOMMENDATIONS

It is recommended that a Phase 2 Intrusive Site Investigation is planned and carried out on site. This should take the form of coring through the concrete flooring or the removal of concrete flooring, with samples then taken from the underlying residual soils and tested for a standard suite of contaminants along with VOC's (TPH CWG).

It is also recommended that a Watching Brief (as outlined in Appendix E) should be had during the course of demolition, site clearance and construction works for any obvious contamination.

12.0 REFERENCES

12.1 LEGISLATION AND REGULATIONS

12.1.1 ACTS

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

12.1.2 PLANNING REGULATIONS

[2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293

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

12.1.3 CONTAMINATED LAND REGULATIONS

[4] The Contaminated Land (England) Regulations 2000. SI2000/No.227

[5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663

[6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

12.2 STATUTORY GUIDANCE

[7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.* Department of Environment, Food and Rural Affairs

[8] Communities and local Government, 2018: National Planning Policy Framework.

12.3 BRITISH STANDARDS

[9] BS 5930:2015 Code of practice for site investigations

[10] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice

[11] BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

[12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

12.4 NON STATUTORY TECHNICAL GUIDANCE

12.4.1 ENVIRONMENT AGENCY

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

12.4.2 CIRIA PUBLICATIONS

[14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association

[15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

12.4.3 CL:AIRE

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

13.0 APPENDICES

APPENDIX A **ENVIRONMENTAL SEARCH**

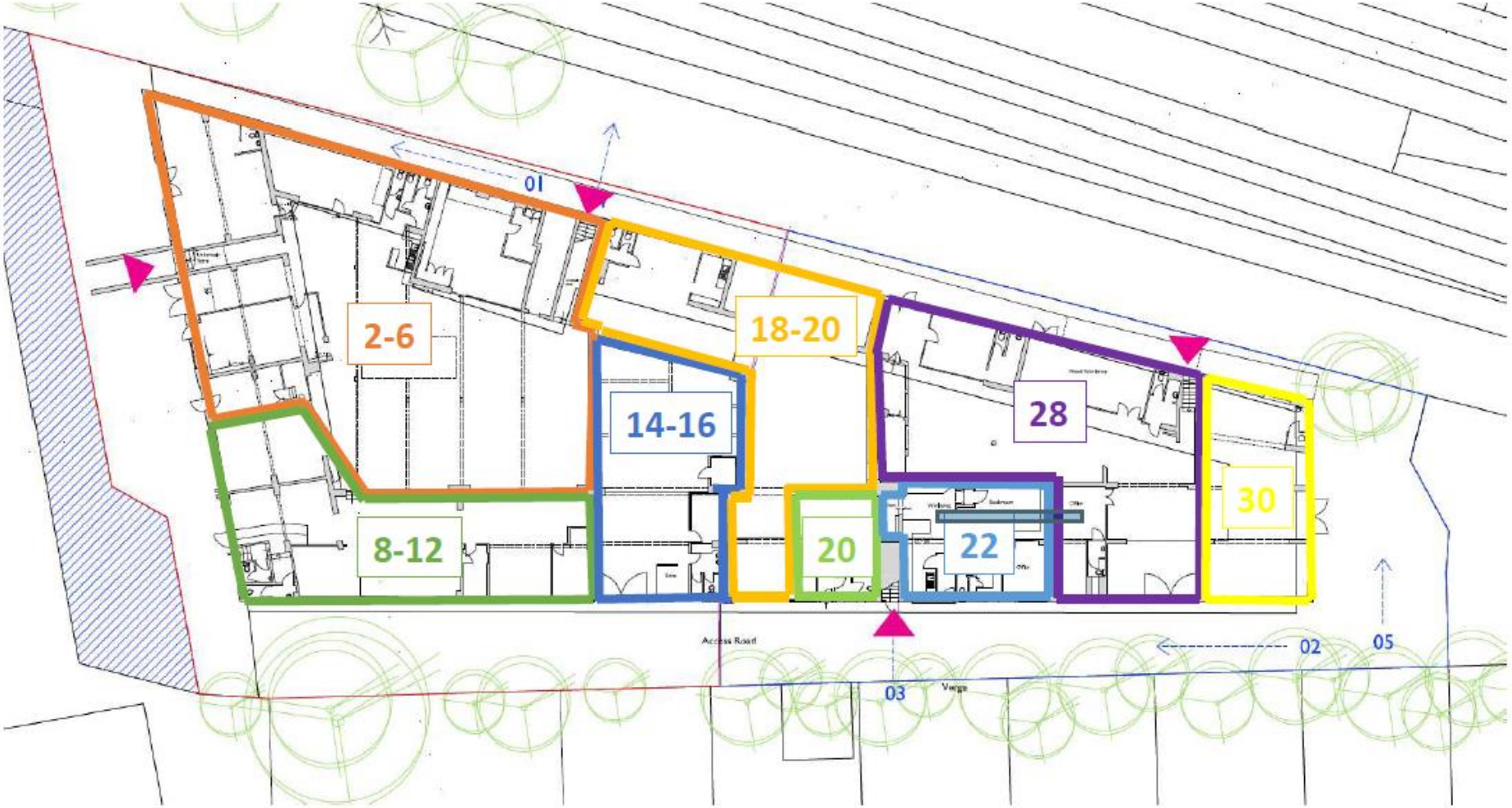
Separate Groundsure Report

APPENDIX B **HISTORICAL MAPPING**

Separate Map Packs (2 No. files)

APPENDIX C CURRENT SITE PLANS

2021 Lease Plan – Ryefield Crescent



APPENDIX D **SITE PHOTOS AND LOCATIONS**

Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: Unit No.28, Ryefield Crescent, Northwood

Client: Hamways Ltd

Photo No.1: Facing slightly NW with shuttered site entrance off-photo to right showing access road Ryefield Crescent

Photo No.2: facing north from Ryefield Crescent showing the shuttered site access and double garage doors

Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: Unit No.28, Ryefield Crescent, Northwood

Client: Hamways Ltd

Photo No.3: Facing north west from just inside the building entrance showing across and storage area

Photo No.4: Example shot of the concrete flooring found throughout the building

Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: Unit No.28, Ryefield Crescent, Northwood

Client: Hamways Ltd

Photo No.5: Facing slightly NW in the rear room showing multiple acrows

Photo No.6: Facing east from the western side of the rear room showing structural pillaring and acrows

Castledine Environmental
LAND CONTAMINATION SURVEYS

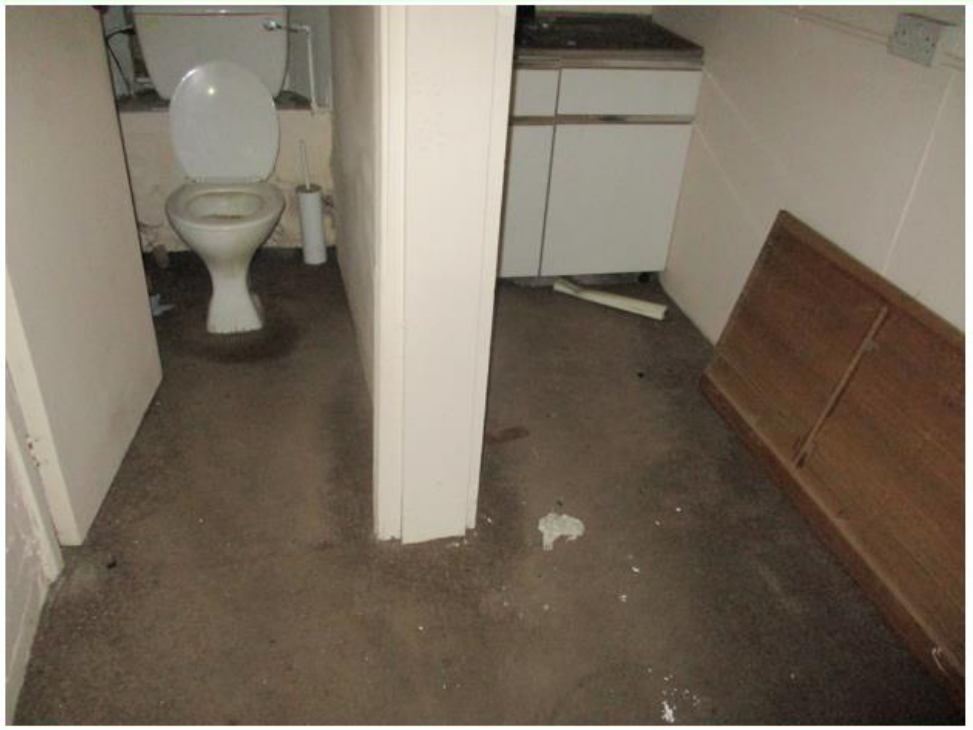
Site Walkover Photos

Address: Unit No.28, Ryefield Crescent, Northwood

Client: Hamways Ltd

Photo No.7: Facing SE in the rear rooms (northern side) of the buildings showing carpet atop concrete flooring

Photo No.8: Toilet adjacent to rear rooms (northern side of building)



Castledine Environmental
LAND CONTAMINATION SURVEYS

Site Walkover Photos

Address: Unit No.28, Ryefield Crescent, Northwood

Client: Hamways Ltd

Photo No.9: Shot showing pooling water on concrete flooring

Photo No.10: Facing north west showing the rear (northern) face of the building and small access-way with railway adjacent

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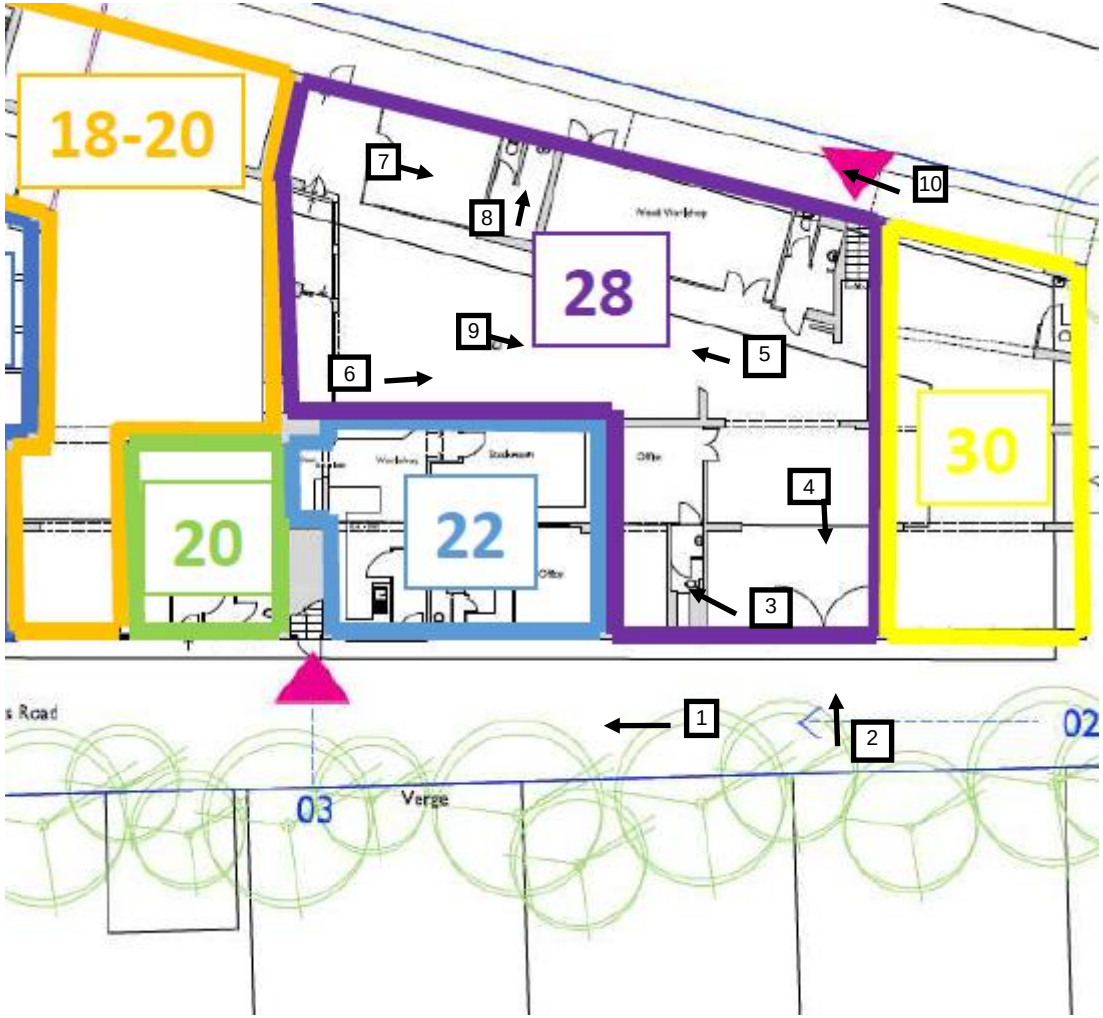
Telephone: 01509 880399 **Mobile:** 07779 305682 kevin@castledineenvironmental.co.uk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APPENDIX E WATCHING BRIEF

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

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

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

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

APPENDIX F DISCOVERY STRATEGY