



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

Proposed Residential Development

on the site of

**Empire Yard, Land to the Rear of
Boots Opticians Ltd,
No.41 High Street, Haverhill
CB9 8AH**

Date: February 2023

Status:

Final Report

Reference:

3468D P1 Rahimi – Haverhill, Suffolk

Date:

09/02/2023

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EXECUTIVE SUMMARY

The site currently comprises an open, vacant plot of land in use for car-parking. The site is located in an urban setting and has been since at least circa.1885. Historically, the site was occupied by linear structures along and within the north western and south eastern boundaries of site and extending north east of and offsite. The central area of site between the buildings was the unoccupied and appeared to be a yard area. The usage of the buildings is unknown; however, they do not resemble dwellings and appear more as workshops. By circa.1926 the southernmost building on site was demolished and by circa.1969 the northernmost buildings are marked as multiple lock-up garage units. These units then extend north east and offsite to further lock-up garage units. Between this date and possibly from circa.1978, a small structure was located in the southern corner of site. This building remains on mapping until contemporary mapping; however satellite imagery shows this building and the lock-up garage units removed by circa.2000. The surrounding areas over time were initially industrial and commercial and have remained commercial unit the present-day.-

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

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

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

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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 Mr. F. Rahimi to undertake a Phase 1 Desk study on a site named Empire Yard, to the rear of Boots Opticians Ltd, No.41 High Street, Haverhill CB9 8AH.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Mr. F. Rahimi and his 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 DC/22/2143/FUL

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 located in Haverhill at National Grid Reference: 567316,245419 and is approximately 0.16ha in area.

The site is square in shape and is orientated with the corners of site to the north, east, south and west. The site is located in a predominantly urbanised, town centre setting and is directly bounded by Brook Service Road to the north east and neighbouring commercial properties to the south, south west (Boots), west (Barclays) and north west with High Street roadside located south east, beyond the commercial properties.

The site interior comprises an open plot of land in use for the parking of cars. Vehicular access is provided to site via an entrance on the north eastern boundary and pedestrian access via an alleyway leading between the commercial properties west and south west of site. On the day of the site walkover, the vehicle access to site was barred by a bollard and the site was occupied by 2 No. vehicles. A commercial-usage bin was then noted in the southern corner of site. The footpath / site access which leads north east from the vehicle access and south west to the pedestrian access was noted to be tarmacked, with the remainder of site occupied by broken concrete and gravels. Patches of vegetation were noted growing through damaged concrete and tarmac in the northern and southern extents of site parking areas.

The usage of the site for parking reasons and noted made ground deposits are considered potential sources of contamination.

Topographically, the site slopes gently from the south west down to the north east and the level of Brook Service Road.

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**

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	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
2	239	SW	Secondary (Undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

The Groundsure report records no abstraction sites located within 250m of site; the nearest active record beyond this is a groundwater abstraction licence related to boiler feeds directly from a borehole located 721m south west of site and in effect from 02/03/2020.

6.1.3 SOURCE PROTECTION ZONE

The site is located in a Type 3 Total Catchment Area Source Protection Zone (SPZ) with further records of Type 3 SPZ's located 69m east, 133m south and 168m south east of site.

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: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Intermediate Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: 3-10m Patchiness value: <90% Recharge potential: Low	Vulnerability: Medium Aquifer type: Principal Flow mechanism: Well connected fractures

6.1.5 GROUNDWATER VULNERABILITY - SOLUBLE ROCK RISK

The Groundsure report records the site as being located in an area where:

“Significant soluble rocks are likely to be present. Low possibility of localised subsidence or dissolution-related degradation of bedrock occurring naturally but may be possible in adverse conditions such as high surface or subsurface water flow.”

6.1.6 POTENTIAL SURFACE WATER

The Groundsure report records the Stour Brook located at surface level 64m north east of site with further records located 133m, 165m north and 164m and 167m east of site.

6.1.7 DISCHARGE CONSENTS

The Groundsure report records historical or surrendered licenced discharge consents held 57m north, 105m north east, 164m east and 199m south east of site (2 No. records here). The records all relate to miscellaneous surface water discharges into Stour Brook and were revoked 21/04/1992 (first 3 No. records) and 08/03/1993 (remaining records).

6.1.8 POLLUTANT RELEASE TO PUBLIC SEWER

The Groundsure report records a site authorise to release pollutants to the public sewer (pollutant unknown) located 198m north east of site at Page Fixing and Supply Ltd which is described as 'effective'.

6.2 PERMITTED PROCESSES

The Groundsure report records an active Part B Permit relating to dry cleaning processes located 118m south east of site.

No further permitted processes are located within 250m of site.

6.3 LIST 2 DANGEROUS SUBSTANCES

The Groundsure report records no List 2 Dangerous Substance sites located within 250m of site; the nearest record beyond this is an inactive Laundrette located 256m north west of site with the authorised substance described as 'pH'.

6.4 POLLUTION INCIDENTS

The Groundsure report records 3 No. incidents located 111m north (2 No. incidents here) and 146m north all of which related to crude sewage materials with a minor impact to land quality and no impact to water or air qualities. The incidents were dated 09/04/2002 (2 No.) and 06/03/2002, respectively. A further 3 No. incidents are then located 187m and 210m north and 244m south east of site, are dated 11/09/2021, 05/04/2002 and 03/03/2002, respectively and related to diesel, surfactants and detergents and mixed/waste oils with minor impacts to land or water quality and no impact to air quality.

No further pollution incidents are recorded within 250m of site and no significant impact incidents located within 500m of site.

6.5 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 250m of site.

6.6 WASTE**6.6.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)**

None recorded within 250m of site.

6.6.2 LANDFILL SITES

None recorded within 500m of site.

6.7 HAZARDOUS SUBSTANCES

None recorded within 250m of site.

6.8 ECOLOGICAL RECEPTORS

The Groundsure report records the site as being located within both the Lower Stour surface waters Nitrate Vulnerable Zone (NVZ) and the Sandlings and Chelmsford groundwater NVZ. Records of Local Nature Reserves named Haverhill Railway Walks are then located 218m and 238m north east and 452m north of site.

No further sensitive land usages are recorded within 500m of site.

6.9 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2023" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

6.9.1 SUPERFICIAL DEPOSITS

Both BGS geological mapping and the Groundsure report record superficial geological deposits of River Terrace Deposits located on site, comprising sands and gravels with local lenses of silt, clay or peat.

6.9.2 BEDROCK DEPOSITS

Both BGS geological mapping Groundsure report record bedrock geology of the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) underlying site, comprising chalk with flints.

6.9.3 ARTIFICIAL GROUND

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

6.9.4 COAL MINING

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

6.9.5 RADON

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

6.10 AERIAL PHOTOGRAPHY

Aerial photography shows the following:

6.10.1 GOOGLE MAPS

The site is shown as located to the rear of commercial properties located along High Street with Brook Service Road located north east of site. The site is occupied by 2 No. cars and a bin at this time, similar to that noted on the site walkover.

6.10.2 GOOGLE EARTH

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

Date	Description
December 1945	Imagery is indistinct; however, the site appears to be located in an urbanised area. No discernible features can be made out on site itself.
December 2000	The site is now clearly shown as occupied by the small car parking area seen on the site walkover. The site is located to the rear of commercial properties and the surrounding areas resemble those seen in the present-day. The site is at this time occupied by at least 4 No. vehicles.
January 2003	Imagery is too indistinct to make any features out on site.

Date	Description
July 2007	No major change on site other than a decrease in the amount of parking vehicles.
December 2007	Site now clear of vehicles.
December 2009	No discernible change on site nor site relevant change to the surrounding areas.
March 2011	Vehicles once again parked on site.
March 2012	No discernible change on site nor site relevant change to the surrounding areas.
July 2015	Imagery is indistinct; however, there appears no discernible change on site nor site relevant change to the surrounding areas.
July 2018	No discernible change on site nor site relevant change to the surrounding areas.
April 2021	Areas in the NW and SE of the parking area now shown with vegetation growing through concrete.
March 2022	No discernible change on site nor site relevant change to the surrounding areas.
April 2022	No discernible change on site nor site relevant change to the surrounding areas.
June 2022	No discernible change on site nor site relevant change to the surrounding areas.

6.11 GOOGLE STREET VIEW

Google Street View imagery is dated April of 2009 with the site viewed off Brook Service Road and facing south west onto site. The vehicle site access sand the car park itself can be seen, with at least 4 No. cars and a bin stored on site at this time. The concrete to either side of the access track is at this time in a better condition than that seen in the present-day and the access track itself has now been newly tarmacked at this time, as seen on the site walkover.

6.12 HISTORIC MAPPING

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

Map	Onsite	Offsite
OS County Series: 1885, 1:10,560	Imagery is small-scale; however, the site appears occupied by structures orientated NE to SW along and within both the NW and SE boundaries of site, with the area between the structures unoccupied. The structures do not resemble dwellings, likely some form of industry with a central yard.	Imagery is small-scale; however, the site appears located within an urbanised, town-centre setting and is directly bounded by buildings to the NW and SE and SW of site. Notable features include factories beyond 50m NW and 100m W of site (this factory building persists until the present-day), a brick works approx.117m with a second located 209m SE and a mainline railway approx.190m NE of site.
OS County Series: 1884-1887, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1888, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1896, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1899, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1902, 1:2,500	No discernible change on site.	Brick works and kilns to the east of site no longer shown on mapping and brick works to the SE of site replaced with terraced housing. Factory approx.100m W of site now marked as brewery.
OS County Series: 1901-1905, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1919-1924, 1:10,560	No discernible change on site.	Large factory building to the west of site now renamed as 'factory'. Minor residential infill to the areas SE of site.

Map	Onsite	Offsite
OS County Series: 1926, 1:2,500	The building orientated NE to SW along the SE boundary of site has now been removed – the building on the NW boundary of site remains and is now marked as a 'cinema'.	Buildings formerly directly NE of site have been removed. Factory to W of site is now marked as a clothing mill. Sidings have been added to the mainline railway approx.180m NE of site.
OS County Series: 1938, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1949, 1:10,560	No discernible change on site.	New residential estates approx.100m SW of site. New large factory approx.160 N of site.
OS County Series: 1951, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
Provisional: 1959- 1960, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1969, 1:2,500	The onsite structure along the NW boundary of site and partially the southern corner of site are now shown as lock-up garage units.	Area directly NE of site occupied by lock-up garage units extending from onsite with a fire station directly beyond this (persistent until present-day). A substation is now directly located SE of site. Buildings SW of site no marked as commercial and as a 'bank' as in the present-day. A vehicle garage is now located approx.12m SW of site. Newly erected factory approx.160m N of site is now marked as a depot.
Provisional: 1967- 1970, 1:10,560	No discernible change on site.	Former clothing factory to west of site now marked as 'works'. Further residential infill to surrounding areas save that to the NE of site and the commercial area along High St.

Map	Onsite	Offsite
National Grid: 1972, 1:10,000	No discernible change on site.	Railway line to the NE of site is now marked as dismantled and removed. Large residential development beyond the railway line NE of site. 'Works' to the west of site now marked as mills. A coal yard is now marked approx.350m N of site.
National Grid: 1974, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1978, 1:10,000	Onsite garages remaining, structure in the southern corner of sit removed.	The lock-up garages formerly adjoining the onsite garages have been demolished and Brook Service Road has been constructed. The area directly NE again of this is now occupied by a a car park, as seen in the present-day. Surrounding areas now starting to resemble that seen in the present-day.
National Grid: 1981, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1988- 1989, 1:1,250	A small structure is located in the eastern corner of site, potentially a single remaining garage unit.	Buildings arrayed along the site-side (NE) of High St and adjacent to site have been extended slightly to the NE, now largely matching those seen in the present-day in shape and layout.
National Grid: 1991, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1994, 1:1,250	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2001, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
Landline: 2003, 1:1,250	Site now marked as 'Empire Yard'.	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: 2023, 1:10,000	Mapping is small-scale and hard to discern, however the remaining 2 No. structures on site appear to have been removed.	Surrounding areas see little site relevant change.

6.13 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
A	0	On site	Boots Hearing Care	Disability and mobility equipment	Consumer products
A	19	SE	Electricity substation	Electrical features	Infrastructure and facilities
B	45	NE	Bus station	Bus and coach stations, depots and companies	Public transport
1	50	W	Specsavers Hearcare	Disability and mobility equipment	Consumer products
C	100	NW	Electricity substation	Electrical features	Infrastructure and facilities
D	105	SE	Autozone	Vehicle parts, accessories	Motoring
E	109	NE	Haverhill Fire Station	Fire Brigade Stations	Central and Local Government
2	110	E	Electricity substation	Electrical features	Infrastructure and facilities
F	130	W	The Mat Factory	Unspecified works or factories	Industrial features
F	130	W	O S Comms	Radar and telecommunications equipment	Industrial products
D	131	SE	Apliances365	Electrical equipment, repair and servicing	Repair and servicing
D	140	SE	Haverhill Amusement	Hobby, sports and pastime products	Consumer products
F	156	W	Electricity substation	Electrical features	Infrastructure and facilities
D	164	SE	Haverhill Echo	Published goods	Industrial products
F	167	W	Tanks	Tanks (generic)	Industrial features
4	185	N	Electricity substation	Electrical features	Infrastructure and facilities

ID	Distance [m]	Direction	Company	Activity	Category
5	194	SW	Reliability Engineering Solutions Ltd	Civil engineers	Engineering services
G	197	NE	Premier Tyres	Vehicle parts and accessories	Motoring
7	213	E	Electricity substation	Electrical features	Infrastructure and facilities
I	219	NW	My Screen Monkey	Electrical equipment, repair and servicing	Repair and servicing
8	222	NE	Gas Distribution Centre	Gas features	Infrastructure and facilities
J	234	W	Telephone Exchange	Telecommunications features	Infrastructure and facilities
J	242	W	Electricity substation	Electrical features	Infrastructure and facilities
K	248	S	Wisdom Toothbrushes	Cosmetics, toiletries and perfumes	Consumer products
9	248	NW	Mast (telecoms)	Telecommunications features	Infrastructure and facilities
K	249	S	Factory	Unspecified works or factories	Industrial features

6.14 PETROL AND FUEL SITES

None recorded within 250m of site; the nearest record beyond this is an obsolete fuel station formerly located 391m south of site.

6.15 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

6.16 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
D	54	NW	Unspecified factory	1885
C	64	S	Smithy	1979
D	76	W	Unspecified factory	1899

ID	Distance [m]	Direction	Use	Date
D	79	NW	Unspecified factory	1885
D	80	NW	Unspecified works	1899
D	84	W	Unspecified factory	1967-1971
D	90	W	Unspecified commercial / industrial	1949-1959
2	92	NE	Unspecified depot	1991
F	98	NE	Fire station	1979
F	103	NE	Fire station	1979
F	105	NE	Fire station	1905
G	107	E	Unspecified tank	1899-1924
E	113	NW	Unspecified factory	1962-1971
H	117	E	Brick works	1885
H	117	NE	Brick works	1896
H	118	NE	Brick works	1938
E	124	NW	Unspecified works	1885
H	134	E	Unspecified kiln	1938
D	137	SW	Unspecified quay	1949
D	145	W	Unspecified tank	1886
I	184	NE	Railway sidings	1977
I	188	NE	Railway sidings	1896
I	198	NE	Railway sidings	1938
I	201	NE	Railway sidings	1885
I	202	NE	Railway sidings	1905
I	203	N	Railway sidings	1885
J	209	NW	Police station	1991
K	209	SE	Brick works	1896
K	210	SE	Brick works	1885
L	211	W	Telephone exchange	1979
K	211	SE	Brick works	1899
I	212	NE	Railway sidings	1885
I	212	NE	Railway sidings	1899
M	213	S	Unspecified works	1967-1971
I	215	N	Railway building	1946-1959
M	216	SE	Unspecified factory	1991
M	216	SE	Unspecified works	1979
J	216	NW	Police station	1979
H	217	NE	Railway sidings	1905
I	218	N	Railway buildings	1899-

ID	Distance [m]	Direction	Use	Date
				1924
I	220	N	Railway buildings	1967-1971
L	220	W	Brewery	1885
I	220	N	Railway building	1896
I	224	N	Railway building	1938
I	226	N	Railway building	1885
I	228	N	Railway building	1938
I	229	N	Railway building	1949
L	230	W	Unspecified tanks	1869
M	230	S	Unspecified pit	1877
J	230	NW	Corn mill	1896-1899
I	234	NE	Railway building	1938
J	238	NW	Corn mill	1885
I	240	N	Railway sidings	1905
N	240	W	Malthouse	1885
L	247	W	Unspecified tank	1896

6.17 HISTORICAL TANK DATABASE

ID	Distance(m)	Direction	Use	Date
1	36	NW	Unspecified tank	1988
G	101	SE	Unspecified tank	1902-1926
G	107	SE	Unspecified tank	1902-1926
G	113	SE	Unspecified tank	1884
D	148	W	Unspecified tank	1884
D	151	W	Tanks	1996
D	153	W	Tanks	1973
D	158	W	Unspecified tank	1926
D	161	W	Tank	1978-1988
H	191	E	Unspecified tank	1988
H	237	E	Unspecified tank	1973-1989
H	241	E	Unspecified tank	1978

6.18 HISTORICAL ENERGY FACILITIES

ID	Distance(m)	Direction	Use	Date
A	0	On site	Electricity substation	1978
A	16	SE	Electricity substation	1968-1996
E	96	N	Electricity substation	1978-1992
G	106	E	Electricity substation	1988-1996
G	108	E	Electricity substation	1978
D	152	W	Electricity substation	1973-1978
D	154	W	Electricity substation	1988

ID	Distance(m)	Direction	Use	Date
H	211	NE	Electricity substation	1989
O	249	W	Electricity substation	1968-1988
P	250	S	Electricity substation	1978-1996
P	250	S	Electricity substation	1968-1973

6.19 HISTORICAL GARAGE DATABASE

ID	Distance(m)	Direction	Use	Date
A	0	On site	Garage	1960
B	11	W	Garage	1960
B	11	W	Garage	1968-1973
B	13	W	Garage	1978
C	22	S	Garage	1960-1968

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

- Potential peat, organic or deleterious materials in superficial geology
- Initial, historical buildings on site of unknown usage (do not resemble dwellings and resembling a series of workshops arrayed with a central courtyard, circa.1885 to circa.1926 when southernmost building demolished)
- Remaining historical building being converted in lock-up garage units (circa.1969 and not seen on satellite imagery dated circa.2007)
- Small structure in east of site (circa.1969-1978/1988)
- On site substation (circa.1978 with date of removal unknown)
- Subsequent usage of the site as a car-park (circa.2000 onwards)
- Made ground deposits noted at surface-level on walkover (likely to be deeper deposits due to site history and urban setting of site)

7.1.2 OFFSITE

- Adjacent and bounding commercial properties (historical usages unknown, present-day bank and opticians – circa.1885 to present-day)
- Substation (between 4-19m SE of site, circa.1978 onwards – spatial mapping errors may influence position of substation)
- Surrounding industrial land usages (large factories approx. 50m NW and 100m W of site, circa.1885 to recent times, large building remains persistent)
- Adjoining and adjacent garage lock-up units (circa.1969 demolished 1978)
- Vehicle repair garage (approx.12m SW of site, circa.1969 to 1989)
- Large-scale car parking usage (directly NE of site, circa.1978 onwards)

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 currently comprises an open, vacant plot of land in use for car-parking. The site is located in an urban setting and has been since at least circa.1885. Historically, the site was occupied by linear structures along

and within the north western and south eastern boundaries of site and extending north east of and offsite. The central area of site between the buildings was then unoccupied and appeared to be a yard area. The usage of the buildings is unknown; however, they do not resemble dwellings and appear more as workshops. By circa.1926 the southernmost building on site was demolished and by circa.1969 the northernmost buildings are marked as multiple lock-up garage units. These units then extend north east and offsite to further lock-up garage units. Between this date and possibly from circa.1978, a small structure was located in the southern corner of site. This building remains on mapping until contemporary mapping; however, satellite imagery shows this building and the lock-up garage units removed by circa.2000. The surrounding areas over time were initially industrial and commercial and have remained commercial until the present-day. Pertinent features from the surrounding areas include the adjacent and bounding commercial properties, present from circa.1885 to the present-day; surrounding industrial features such as various factories (located approximately 50m north and 100m west, that to the west remains persistent until the present-day); adjoining lock-up garages to those on site, demolished by circa.1978 and a subsequent, large-scale car-park here; a historical vehicle repair garage approximately 12m south west of site and present between circa.1969-1989 and an onsite and adjacent electricity substation (location possibly an error due to spatial mapping issues). Whilst some of the offsite potential sources are some distance from site, superficial deposits may provide a pathway to site via gravels and sands (although likely to be predominantly clayey) and bedrock deposits (Seaford Chalk) are very high in permeability (along with possible solution features), which provide credible pathways to site.

The historical setting and usage of the site, various demolitions on site and the subsequent usage for a substation and car parking are considered potential sources of contamination, capable of impacting site with various substances including:

- Metals and metalloids (demolitions, workshop usages, garages)
- Polycyclic aromatic hydrocarbons (PAH's) (made ground deposits, workshop usages, potential for fires or ashy debris)
- Petroleum hydrocarbons, MTBE (unknown usage workshops / structures, usage as car-park, adjacent car-parking usage, nearby vehicle repair garage)
- VOC's (demolitions, workshop usages, garages, nearby vehicle repair garage)
- Asbestos (age of structures on site, lock-up garage units, potential for made ground deposits)
- Polychlorinated Bithenyls (PCB's – onsite and adjacent substation)

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

Potential sources of both ground gas and vapour generation identified both on and nearby to site. Potential sources of vapour including vehicle parking and storage, garage lock-up units, unknown workshop usages and nearby car-parks are considered more of a pertinent hazard to site workers, end-users and structures than ground gas hazards; however, the site is located atop superficial deposits which may contain deleterious materials such as peat (gas in peat is historically generated and trapped / adsorbed, should new pathways be formed during site works, a large release of built-up gases may be caused) as such, both ground gas and vapour conditions should be investigated further.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Direct Ingestion & Direct Contact	Site Workers (<i>during site works, excavations, eating & drinking</i>)	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons, considered usage and adherence to relevant HSE guidance would be sufficient to mitigate this risk to low – following confirmation via a Phase 2 SI. Potential sources of contamination noted both onsite and in proximity. Due to the sensitive, proposed residential end-use of the site (along with proposed garden spaces) and the risks to site workers during the site works, it is recommended that a proportionate Phase 2 Intrusive Site Investigation is planned and carried out on site. This should involve dynamic window-sampler borehole formation across the site, to facilitate the assessment of ground conditions, the taking of environmental samples and to allow a subsequent regime of ground gas and vapour monitoring.
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Inhalation of Dust	Site Workers (<i>during site works, excavations, eating & drinking</i>)	Li	Md	M	
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Plant Uptake & Direct Ingestion & Direct Contact	End Users (<i>Residents/tenants, visitors, children, service personnel</i>)	Li	Md	M	
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Inhalation of Dust	End Users (<i>Residents/tenants, visitors, children, service personnel</i>)	Li	Md	M	
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Plant Uptake & Direct Ingestion & Direct Contact	Flora and Fauna (<i>on and offsite – urban setting reduces risk slightly</i>)	Lw	Md	M/L	
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Vertical and lateral migration (<i>superficial deposits may provide some protection, bedrock highly permeable</i>)	Controlled Waters (<i>Principal & Secondar A Aquifers, Stour Brook</i>)	Lw	Md	M/L	
Contaminated Soils (<i>unknown usages structures, demolished, lock-up garage units, car-parking, made ground & substation</i>)	Direct contact (<i>pipe degradation and leaching</i>)	Services (<i>impacted potable supply piping</i>)	Li	Md	M	
Ground Gases (Methane and CO ₂) (<i>potential for peat deposits beneath site, potential for significant depth of made ground</i>)	Vertical and lateral migration (<i>potential pathways provided via both superficial and bedrock geologies</i>)	Site Workers & Excavation, End Users & Building Envelope (<i>ingress and build-up</i>)	UI	Sv	M/L	Potential sources of both ground gas and vapour generation identified on and nearby site with superficial and bedrock geologies potentially providing credible pathways to site – recommend further investigation as part of a Phase 2 SI with integrated gas and vapour monitoring and provision for usage of a PID.
Volatile and Semi-volatile Organic Compounds (<i>lock-up garages, nearby vehicle garage & car-parks, onsite parking</i>)	Vertical and lateral migration (<i>potential pathways provided via both superficial and bedrock geologies</i>)	Site Workers & Excavation, End Users & Building Envelope (<i>ingress and build-up</i>)	Li	Md	M	
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	Site is not located in a radon Affected Area.

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

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

TABLE 2. RISK CLASSIFICATION MATRIX

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

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

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

TABLE 3. CLASSIFICATION OF RISK

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

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

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

10.0 SUMMARY OF RISKS**10.1.1 SOIL CONTAMINATION**

The site currently comprises an open, vacant plot of land in use for car-parking. The site is located in an urban setting and has been since at least circa.1885. Historically, the site was occupied by linear structures along and within the north western and south eastern boundaries of site and extending north east of and offsite. The central area of site between the buildings was the unoccupied and appeared to be a yard area. The usage of the buildings is unknown; however, they do not resemble dwellings and appear more as workshops. By circa.1926 the southernmost building on site was demolished and by circa.1969 the northernmost buildings are marked as multiple lock-up garage units. These units then extend north east and offsite to further lock-up garage units. Between this date and possibly from circa.1978, a small structure was located in the southern corner of site. This building remains on mapping until contemporary mapping; however satellite imagery shows this building and the lock-up garage units removed by circa.2000. The surrounding areas over time were initially industrial and commercial and have remained commercial unit the present-day. Pertinent features from the surrounding areas include the adjacent and bounding commercial properties, present from circa.1885 to the present-day; surrounding industrial features such as various factories (located approximately 50m north and 100m west, that to the west remains persistent until the present-day); adjoining lock-up garages to those on site, demolished by circa.1978 and a subsequent, large-scale car-park here; a historical vehicle repair garage approximately 12m south west of site and present between circa.1969-1989 and an onsite and adjacent electricity substation (location possibly an error due to spatial mapping issues). Whilst some of the offsite potential sources are some distance from site, superficial deposits may provide a pathway to site via gravels and sands (although likely to be predominantly clayey) and bedrock deposits (Seaford Chalk) are very high in permeability (along with possible solution features), which provide credible pathways to site.

The historical setting and usage of the site, various demolitions on site and the subsequent usage for a substation and car parking are considered potential sources of contamination.

10.1.2 GROUND GASSES AND VAPOURS

Potential sources of both ground gas and vapour generation identified both on and nearby to site. Potential sources of vapour including vehicle parking and storage, garage lock-up units, unknown workshop usages and nearby car-parks are considered more of a pertinent hazard to site workers, end-users and structures than ground gas hazards; however, the site is located atop superficial deposits which may contain deleterious materials such as peat (gas in peat is historically generated and trapped / adsorbed, should new pathways be formed during site works, a large release of built-up gases may be caused) as such, both ground gas and vapour conditions should be investigated further.

11.0 RECOMMENDATIONS

Potential sources of contamination noted both onsite and in proximity to site. Due to the sensitive, proposed residential end-use of the site (along with proposed soft-landscaped garden spaces) and the risks to site workers during the site works, it is recommended that a proportionate Phase 2 Intrusive Site Investigation is planned and carried out on site. This should involve dynamic window-sampler borehole formation across the site, to facilitate the assessment of ground conditions (i.e. made ground, natural or reworked natural deposits, their nature, extent and depth), the taking of environmental samples and to allow a subsequent regime of ground gas and vapour monitoring. Provision should also be made for the usage of a photon-ionisation detector (PID) during the site works, due to the potential for hydrocarbon presence on site. The combination of these works will inform the extent of any remediation required (if any), the ground gas and vapour regime on site, if barrier piping specification is required for new potable piping and the extent of PPE required for site workers.

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

PROPOSED AND CURRENT SITE PLANS



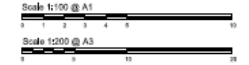
03 Proposed First Floor
100 1:100 @ A1
1:200 @ A3



01 Key Plan
100

02 Proposed Ground Floor
100 1:100 @ A1
1:200 @ A3

- Unit 1 - Studio - 39m²
- Unit 2 - 1 Bed - 56m²
- Unit 3 - 3 Bed - 84m²
- Unit 4 - 2 Bed - 81m²

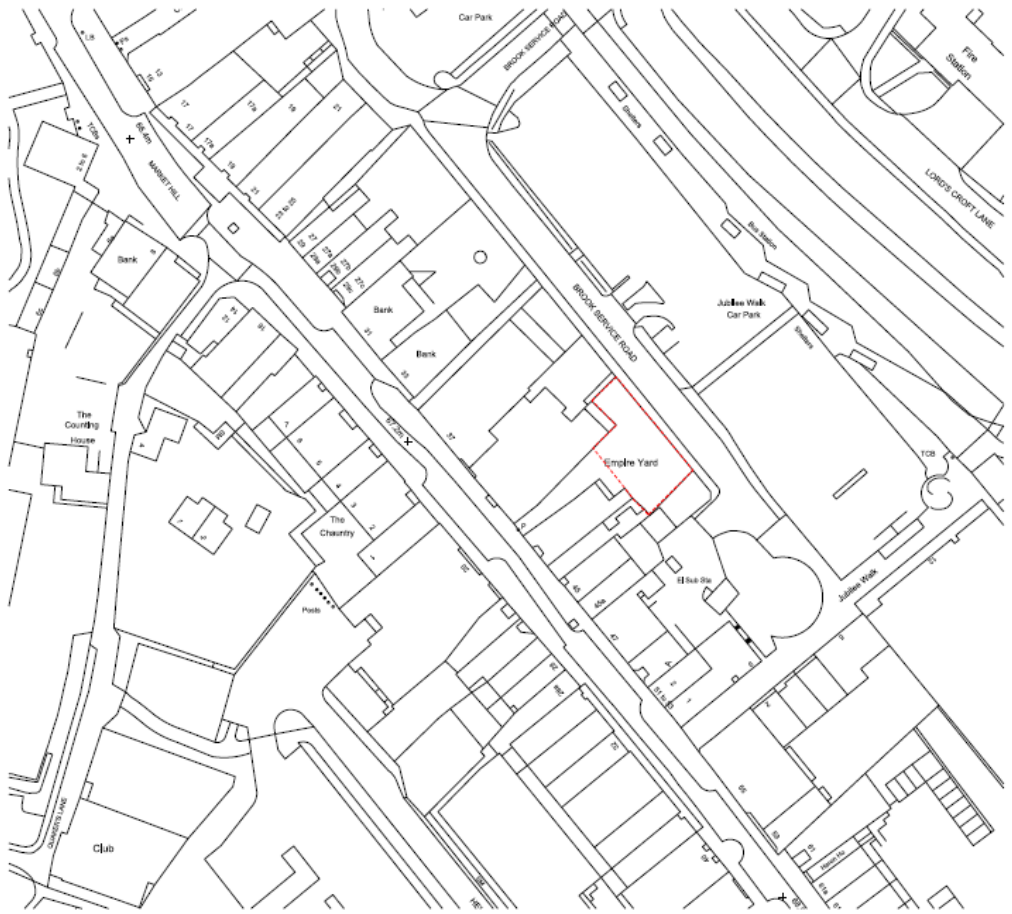
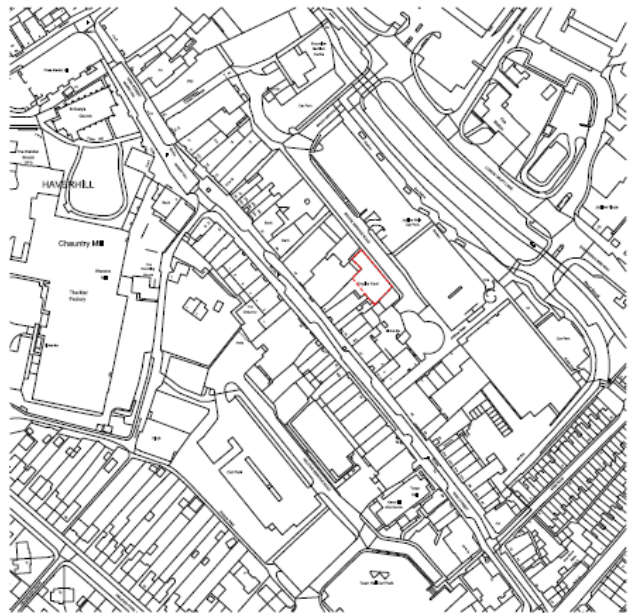


Project Empire Yard	Drawing PROPOSED GROUND & FIRST FLOOR PLAN				<table border="1"> <tr> <th>Rev</th> <th>Issued</th> <th>Description</th> <th>Drawn by</th> <th>Check by</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	Rev	Issued	Description	Drawn by	Check by					
	Rev	Issued	Description	Drawn by		Check by									
Stage Planning	SCALE	ISSUE DATE	PROJECT NO.	DRAWING NO.	REVISION										
	VAR	05/12/2022	100	A-EMPY-100-100											

General Notes
For existing building, grid dimensions are for reference only. Always refer to site conditions and seek Designer's advice should deviation occur. Do not scale drawings. All dimensions are in inches unless noted otherwise. Designer's shall be notified in writing of any discrepancies. Drawings are subject to Engineer's input and confirmation.

3468D P1 Rahimi – Haverhill, Suffolk

Castledine Environmental



01 Existing Location Plan
000
Scale 1:1250 @ A1
Scale 1:2500 @ A3

02 Existing Site Plan
000
Scale 1:500 @ A1
Scale 1:1000 @ A3

Project Empire Yard	Drawing EXISTING LOCATION AND SITE PLAN				<table border="1"> <thead> <tr> <th>No.</th> <th>Date</th> <th>Description</th> <th>Drawn by</th> <th>Check by</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No.	Date	Description	Drawn by	Check by																				
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General Notes
For existing building, grid dimensions are for reference only. Always refer to site conditions and seek Designer's advice should deviation occur.
Do not scale drawings.
All dimensions are in inches unless noted otherwise. Designer's shall be notified in writing of any discrepancies. Drawings are subject to Engineer input and confirmation.

APPENDIX D

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

Photo No.1: Facing south from Brook Service Rd showing the north eastern boundary of site and vehicle access



Address: Empire Yard, Rear of High St, Haverhill
Client: Mr. M. Rahimi

Photo No.2: Facing west from Brook Service Rd showing the north eastern boundary of site and vehicle access





Site Walkover Photos

Address: Empire Yard, Rear of High St, Haverhill
Client: Mr. M. Rahimi

Photo No.3: Facing north from onsite showing the former lock-up garage unit area and fractured concrete here

Photo No.4: Facing NE from onsite showing the former location of structure and made ground gravels on site



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 ash 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

