



Your Environment

PHASE 1: DESKTOP STUDY AND
PRELIMINARY RISK ASSESSMENT
REPORT FOR
47F,
BROAD STREET,
BANBURY,
OX16 5BT.

For Cornerstone Place

Your Environment

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Appendix C - Historical Ordnance Survey Maps

Appendix D - Site Walkover Photographs

Executive Summary

Summary of Contamination Recommendations

The below table shows a snapshot of the recommendations concerning ground contamination within this report. It is advised that the report is read in its entirety to gain a better understanding of our findings and recommendations. This section is relevant to Contamination ONLY and further recommendations concerning other aspects may be presented later in this report.

Potential Linkage	No Investigation Recommended	Investigation Recommended
Soil Contamination		✓
Ground Gas	✓	

Investigation Recommended

We have identified one or more potential material sources of contamination within the site itself or in the surrounding area that may, if present, represent a risk of harm to users of the development. Investigation of the site is recommended to enable a robust assessment of this risk to be made, and we would further recommend that further development works on the site do not take place until this investigation has been completed and reported.

1.0 Introduction

YourEnvironment (YE) was instructed by Cornerstone Place to produce a Phase 1: Desktop Study and Preliminary Risk Assessment Report for the site located at 47f, Broad Street, Banbury, OX16 5BT (grid ref: 445632 240395; area: 0.02ha).

We understand current plans for the redevelopment of the site comprise:

- Conversion of current property into three (3no.) storey flat with fourteen (14no.) self-contained residential units for lease.

A proposed site plan provided to YE, at the time of issuing this report can be reviewed within **Appendix A**.

Objectives

The objectives of this Phase 1 report are to:

- Establish the environmental setting, including sensitivity in relation to human health, surface water, groundwater and ecological receptors;
- Review historical and recent uses to assess the potential for contamination to be present from past and current land-use;
- Assess by qualitative means the potential nature and extent of contamination from those uses and the environmental risk and liabilities which may affect the site redevelopment; and
- Identify the prevalent source-pathway-receptor linkages present on site by means of a Tier 1 contamination risk assessment which incorporates the formulation of a Conceptual Site Model.

Information Sources

During the production of this report the following primary information sources have been utilised:

- Enviro + Geo Insight data obtained from Groundsure; and
- Historical Ordnance Survey mapping at scales ranging from 1:1,250 to 1:10,560, obtained from Groundsure.

The full information from these sources can be reviewed within **Appendices B & C**.

2.0 Environmental and Geological Setting

Information on the environmental and geological setting of the site is presented in a Groundsure Enviro + Geo Insight Report prepared for the site, a copy of this report is reproduced in **Appendix B**.

2.1 Site Geology

Site geology has been assessed by reference to information from British Geological Survey mapping summarised in the Groundsure Enviro + Geo Insight data. Information from these sources referenced in this report has been predominantly limited to that identified within 50m of the site (underlying geology) or 250m of the site (structural features, borehole records), in order to focus on the information directly relevant to the site. Information from outside these radii will be referenced when deemed relevant.

Superficial Ground and Drift Deposits

There are no records of superficial deposits underlying the site.

Bedrock Geology

Underlying the site is bedrock comprised the Charmouth Mudstone Formation (mudstone).

Landslips

There are no records within 250m.

Linear Features

There are no records within 250m.

Natural Ground Subsidence

The following hazard ratings applicable to the site and land within 50m are presented in the Enviro + Geo Insight Report:

Shrink swell clays	Low
Running sands	Negligible
Compressible deposits	Negligible
Collapsible deposits	Very low
Landslides	Very low
Ground dissolution	Negligible

Table 2.1: Natural Ground Subsidence

2.2 Site Hydrogeology and Hydrology

These records are derived by Groundsure from Environment Agency and British Geological Survey data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report. Information from these sources referenced in this report has been predominantly limited to that identified within 250m of the site (aquifers, surface water) or 1000m of the site (abstractions), in order to focus on the information directly relevant to the site. Information from outside these radii will be referenced when deemed relevant.

Table 2.2 presents Environment Agency aquifer designations:

Principal Aquifer	Layers with high intergranular and/or secondary permeability capable of supporting water supplies at strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Major Aquifers.
Secondary (A) Aquifer	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.
Secondary (B) Aquifer	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water bearing parts of former Non-Aquifers.
Secondary Undifferentiated Aquifer	Layers that cannot be attributed to a category A or B rock type. These layers could have previously been described as a minor or a non-aquifer due to their variable characteristics.
Unproductive strata	Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Table 2.2: Aquifer Designations

Aquifer within Superficial Deposits

No superficial deposits are recorded on the site.

Aquifer within Bedrock Geology

As a result of the bedrock geology on site, the Charmouth Mudstone Formation is designated as being a Secondary (undifferentiated) aquifer.

Water Framework Directive Groundwater Bodies

The site is within the Banbury Jurassic groundwater water body.

Permeability of Bedrock Deposits

The minimum and maximum permeabilities are both described as being low.

Groundwater Vulnerability

Table 2.2 presents Environment Agency groundwater vulnerability definitions:

High Vulnerability	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 Vulnerability	Intermediate between high and low vulnerability.
Low Vulnerability	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.

Table 2.2: *Groundwater Vulnerability Definitions*

The groundwater vulnerability in the vicinity of the site is classified as high due to the bedrock aquifer underlying the site.

Groundwater Abstraction Licences

There are no groundwater abstraction licences within 1000m.

Surface Water Abstraction Licences

There are no surface water abstraction licences within 1000m.

Potable Water Abstraction Licences

There are no potable abstraction licences within 1000m.

Source Protection Zones

There are no records within 250m.

Ordnance Survey Water Network

There are no records within 250m.

Surface Water Features

There are no records within 250m.

Water Framework Directive Surface Water Bodies and Catchments

The site is within the Cherwell (Cropredy to Nell Bridge) river water body catchment, which is located 440m east.

2.3 Environmentally Sensitive Areas

These records are derived by Groundsure from Environment Agency, Natural England, Historic England, English Heritage, Forestry Commission and UK Government data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report. Information from these sources referenced in this report has been predominantly limited to that identified within 500m of the site (environmental designations) or 250m of the site (habitat, visual and cultural designations), in order to focus on the information directly relevant to the site. Information from outside these radii will be referenced when deemed relevant.

Environmental and Habitat Designations

The site is within a nitrate vulnerable zone for surface water.

There are no habitat designation records within 250m of the site.

Visual and Cultural Designations

The site is located with the Banbury conservation area.

There are sixty-nine (69no.) records of listed buildings within 250m of the site, the closest being 80m west, followed by 86m northwest, these are both grade II listings. All other records are over 100m from the site.

3.0 Past Land Use and Potential Contaminant Sources

Information on past land use and potential contaminant sources is presented in a Groundsure Enviro + Geo Insight Report prepared for the site, a copy of this report is reproduced in **Appendix B**.

3.1 Land Use Records

These records are derived by Groundsure from historical mapping and each record corresponds to a particular map revision date. Thus, several records may refer to the same feature where it is present over time. Groundsure has in some cases grouped such records in the Enviro + Geo Insight report. Differences in distances quoted from the study site may be due to expansion of the feature over time or geolocation errors.

Information from these sources referenced in this report has been predominantly limited to that identified within 250m of the site, in order to focus on the information directly relevant to the site. Information from outside this radius will be referenced when deemed relevant.

Historical Industrial Land Uses

There is one (1no.) record within 250m, located 203m southeast for an unspecified works.

Historical Tanks

There are eight (8no.) records within 250m, the closest of which is for an unspecified tank located 173m southwest. This is followed by an unspecified tank 176m northeast, as well as three (3no.) records for a tank at 186m south. All other records are over 190m from site.

Historical Energy Features

There are eleven (11no.) electrical substation records within 250m of the site, the closest of which is 81m northwest. All other records are over 100m of the site and include an electricity transformer 223m southwest.

Historical Petrol Stations

There are no records of historical petrol stations within 250m.

Historical Garages

There are three (3no.) records for garages on site dated 1977, 1982 and 1987, also covering buildings to the immediate east of the site. The closest off site records are 36m and 37m east. All other records are over 150m from site.

Historical Military Land

There are no records of historical military land within 250m.

Current or Recent Industrial Land Uses

There are thirty-three (33no.) records within 250m, the closest is a warehouse 3m north, followed by an arms and ammunition site 15m east. 30m east is a camping equipment firm, and a trophies manufacture 58m northeast. There are two (2no.) records for print and design sites located 65m and 68m north. All other records are over 80m from site.

Current or Recent Petrol Stations

There are no records of current or recent petrol stations within 250m.

Electricity Cables

There are no records of high voltage underground electricity cables within 250m.

Gas Pipelines

There are no records of high pressure underground gas pipelines within 250m.

Railway Infrastructure

There are no records of historical or current railway infrastructure or projects within 250m.

3.2 Environmental Permits, Incidents and Registers

These records are derived by Groundsure from local authority, Health and Safety Executive and Environment Agency data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report. Information from these sources referenced in this report has been predominantly limited to that identified within 250m of the site, in order to focus on the information directly relevant to the site. Information from outside this radius will be referenced when deemed relevant.

Sites Determined as Contaminated Land

There are no records of sites determined as contaminated land under Part 2A of the Environmental Protection Act 1990 within 250m.

Control of Major Accident Hazards (COMAH)

There are no records within 250m.

Regulated Explosive Sites

There are no records within 250m. Note that details of some sites may be redacted for security reasons.

Planning Hazardous Substances Consents

There are no records within 250m.

Records of Historic IPC Licensed Activities

There are no records within 250m.

Records of Part A (1) Licensed Activities

There are no records within 250m.

Records of Part A (2)/B Licensed Activities and Pollutant Release

There are no records within 250m.

Records of Radioactive Substance Authorisations

There are no records within 250m.

Licensed Discharges to Controlled Waters

There are no records within 250m.

Pollutant release to Surface Waters (Red List)

There are no records within 250m.

Pollutant Release to Public Sewer

There are no records within 250m.

List 1 and List 2 Dangerous Substances

There are no records within 250m.

Substantiated Pollution Incidents

There are three (3no.) records within 250m, the closest is 161m northwest for firefighting runoff with no impact. A further record is located 189m northwest for diesel, with a minor impact to water and land, and finally, a record 234m north for firefighting runoff with no impact.

Pollution Inventory Substances

There are no records within 250m.

Pollution Inventory Waste transfers

There are no records within 250m.

Pollution Inventory Radioactive Waste

There are no records within 250m.

3.3 Waste and Landfill

These records are derived by Groundsure from Environment Agency, British Geological Survey, Ordnance Survey (interpreted by Groundsure) and local authority data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report.

Information from these sources referenced in this report has been predominantly limited to that identified within 500m of the site (landfills) or 250m of the site (non-landfill waste operations), in order to focus on the information directly relevant to the site. Information from outside these radii will be referenced when deemed relevant.

Active or Recent Landfill

There are no records for active or recent landfill within 250m.

Historical Landfill

There are no records for historical landfill within 250m.

Non-Landfill Waste Records

There are no records for historical waste sites within 250m.

Waste exemptions are made available for certain specified activities considered to pose a low risk to the environment and allowable waste types and quantities are limited. There is one (1no.) record located 198m west relating to the sorting and disposal of controlled drugs, probably held by a pharmacy or surgery.

3.4 Mining, Ground Workings and Natural Cavities

These records are derived by Groundsure from British Geological Survey, Ordnance Survey (interpreted by Groundsure), Coal Authority, Peter Brett Associates, Johnson Poole and Bloomer, Cheshire Brine Subsidence Compensation Board, British Gypsum, Mining Searches UK, Kaolin and Ball Clay Association and local authority data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report.

Information from these sources referenced in this report has been predominantly limited to that identified within 250m of the site, in order to focus on the information directly relevant to the site. Information from outside these radii will be referenced when deemed relevant.

Natural Cavities

There are no records within 250m.

Mining Cavities

There are no records within 250m.

BritPits Data (Surface and Underground Mineral Workings)

There are no records within 250m.

Historical Mineral Planning Areas

There are no records within 250m.

Surface Ground Workings

There is one (1no.) record 180m southwest referring to a fishpond.

Underground Workings

There are no records within 250m.

Coal Mining

There are no records held by the Coal Authority or by Johnson Poole and Bloomer within 250m.

Non-Coal Mining

There are no records within 250m.

3.5 Radon and Background Soil Chemistry

These records are derived by Groundsure from British Geological Survey and Public Health England data. Details of the source and coverage of specific records are provided in the Enviro + Geo Insight Report. Information from these sources referenced in this report has been predominantly limited to that identified on or within 50m of the site.

Radon

The study site is not located within a Radon Affected Area, as less than 1% of properties are above the Radon Action Level. No radon protective measures are necessary for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment.

Background Soil Chemistry

Values estimated by BGS for background concentrations of five potentially harmful elements are provided as follows:

- Arsenic: 15-25 mg/kg;
- Bio-accessible arsenic: No data;
- Lead: 100-200 mg/kg;
- Bio-accessible lead: 60-120 mg/kg;
- Cadmium: 1.8 mg/kg;
- Chromium: 90-120 mg/kg;
- Nickel: 30-45 mg/kg.

These values are not considered to be elevated with respect to guideline values for residential end-uses.

4.0 Historical Mapping Study

The object of this search was to report on the evidence of site history and redevelopment of the site and its environs from available County Series and Ordnance Survey Maps at scales ranging from 1:1,250 to 1:10,560 dating from the mid to late 19th Century to the present day, and Getmapping PLC aerial photography dating from the late 1990s to the recent past, as provided by Groundsure.

Information in the historical mapping study has been predominantly limited to that identified on the site or within 100m of the site, in order to focus on the information directly relevant to the site. Information from outside this radius will be referenced when deemed relevant.

Each map or photographs only represents a “snap-shot” of the site and its environs at the date of the survey. Changes that had occurred at other times may not have been recorded on the maps and could represent an unidentified hazard to the site.

The information reported might not represent all pertinent information that could be obtained. The interpretation of the maps and/or other data commented on in this report is subjective.

Year	On site	Off site
1881-1884	Site is undeveloped, presumed part of a large green open space.	Residential in all directions No specifically identified industrial or commercial uses within 250m. No specifically identified commercial/industrial uses within 250m
1900	Site has now been developed into an unspecified structure (also covering adjoining land to north and east) but does not appear to resemble the same shape as the current development.	Commercial/industrial uses identified include: Salvation army barracks 75m northwest Timber yard 75m southeast Steam sawmill 110m, and 230m southeast Smithy 120m west

		Brewery 120m northeast Malthouse 225m east Agricultural works 250m east Graveyard 250m northwest
1922 - 1938	No discernible changes	Additional commercial/industrial uses identified include: Motor works 150m southwest Steam sawmill 230m southeast 2no Graveyards 250m northwest
1955 - 1968	Site shown as part of a warehouse	Additional commercial/industrial uses identified include: Surgery 50m south Builders yard 60m northwest, and 80m southeast Agricultural repair depot 70m north Engineering works 90m east Printing works 120m southwest Depot 120m and 150m east Builders yard 150m southeast Tanks 150m southeast Surgical appliance factory 150m southeast Laundry 200m southeast Brewery including tanks and chimney 200m northeast Furniture factory 230m west Telephone exchange 230m west Warehouse 230m east Telephone engineering centre 240m east Furniture factory 240m southeast Garage 250m west
1980 - 1986	Site shown as part of a garage	Additional commercial/industrial uses identified include: Warehouse 1m and 5m north Garage/Potential fuel station 70m east
1990 - 1994	Site no longer shown as part of a garage. Layout now consistent with present layout.	No relevant changes
1999	Aerial photograph shows site layout consistent with current site.	Surrounding area mixed residential/commercial
2001	No discernible changes	No relevant changes
2003	No discernible changes	Garage/Potential fuel station 70m east now redeveloped, use not stated.
2006	No discernible changes	No relevant changes
2009	No discernible changes	No relevant changes
2010	No discernible changes	No relevant changes
2016	No discernible changes	No relevant changes
2019	No discernible changes	No relevant changes
2020	No discernible changes	No relevant changes

Table 4.1: *Historical Mapping Review*

The Historical Ordnance Survey Maps were obtained from Groundsure and are available for review within **Appendix C**. The aerial photographs are included in the Groundsure Enviro + Geo Insight Report and are available for review within **Appendix B**.

5.0 Walkover Survey

YourEnvironment attended the site on July 15th 2020. The weather was overcast at the time.

Current Site Use

The site is currently operating as what appears to be an upholstery workshop, and light vehicle repairs on the ground floor, with offices occupying the first and second floors.

Access

The site is accessible from a shared access road and courtyard which leads from Broad Street. The access road has gates on it which can be opened to provide vehicle access. In the north west corner of the courtyard, is the study site, with a pedestrian doorway on its south east corner leading to a stairway up to the offices. The main building has a pedestrian doorway and a metal roller shutter door on the ground floor providing access into the building for both pedestrian and small vehicles.

Topography

The land both on and surrounding the site is relatively flat and level.

Buildings and Structures

There is one main building located on the site, a three storey industrial type warehouse/workshop. Constructed from brick with a corrugated metal roof and walls on the exterior of the first and second floors. The building has a concrete floor covering. An additional brick built enclosed stairway is located on the south east corner of the building providing access to the second floor.

Hard Surfaced Areas

The site as a whole is hard surfaced. Asphalt is located on the exterior of the eastern end of the site acting as the parking area with a concrete floor covering within the building.

Landscaped and Vegetated Areas

A small area of vegetation is located east of the building, located within the parking area of the site. Bushes and low level trees approximately two to three metres in height are located here as well as some lower level weeds and nettles.

Surface Permeability / Ground Covering

It is estimated that approximately 95% of the site is non-permeable asphalt or concrete with approximately 5% comprising soft landscaping in the parking area.

Drainage Features

One man hole was identified upon the site, located east of the building within the sites parking area.

Located in the south west corner of the ground floor was an industrial washing machine, with plumbing and drainage located within the same corner.

Other Services

It was evident that the site has access to electricity and water.

Direction	Description of Site boundary
North	Exterior building boundary wall of the site and the neighbouring property located north.
East	No defined boundary.
South	Building boundary wall of the site and the neighbouring property.
West	Not identified due to access but believed to be the exterior boundary wall of the site.

Table 5.1: Summary of site boundaries

Direction	Description of Surrounding Land Use
North	Commercial and residential properties and their respective garden areas.
East	Courtyard and access roadway for the rear of properties located on Broad Street - some commercial and residential dwellings.
South	Commercial health and fitness centre with further commercial properties.
West	Residential dwellings and their respective garden areas.

Table 5.2: Summary of Surrounding Land Uses

Potentially Contaminative Land Uses

On site sources:

- Car tyres located within the ground floor of the site;
- Vehicle maintenance and evidence of aerosols used on the ground floor; and
- Industrial washing machine located on the ground floor.

Off site sources:

- Commercial properties surrounding the site on its north, east and southern flanks.

Photographs taken during the walkover of the site and surrounds, can be reviewed within **Appendix D**.

6.0 Framework for Assessment of Contamination

Environmental risks are assessed within the risk management framework established in Part IIA of the Environmental Protection Act (EPA) 1990 introduced by Section 57 of the Environment Act 1995 which provides a statutory definition of contaminated land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled water is being or is likely to be caused.

Risk from contamination is assessed by consideration of possible linkages between contaminant sources and potential receptors which could be harmed or polluted.

The key aspect of the framework is the development of a Conceptual Site Model (CSM) which illustrates the spatial interaction between the potential sources and receptors on site.

The information presented in this report was collated and evaluated to develop an initial CSM to assess ground contamination issues at the site.

For a risk of pollution or environmental harm to occur as a result of ground contamination, **all** of the following elements must be present:

- A source, i.e., a substance that is capable of causing pollution or harm;
- A receptor, i.e., something which could be adversely affected by the contaminant; and
- A pathway, i.e., a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

Potential sources, pathways and receptors are identified in the sections below and the risks associated with possible pollutant linkages outlined.

7.0 Possible Contaminant Sources

On Site Sources

The following possible on site sources have been identified from the historical study:

- Historical development;
- Warehouse; and
- Garage.

The following on site sources have been identified from the site walkover:

- Car tyres located within the ground floor of the site;
- Vehicle maintenance and evidence of aerosols used on the ground floor; and
- Industrial washing machine located on the ground floor.

The following possible on site sources have been identified from the Enviro + Geo Insight data:

- Use as garage.

Off Site Sources

The following off site sources have been identified from the historical study:

- Warehouse 1m north;
- Surgery 50m south;
- Builders yard 60m northwest;
- Potential fuel station and garage 70m east;
- Agricultural repair depot 70m north;
- Salvation army barracks 75m northwest;
- Timber yard 75m southeast;
- Engineering works 90m east;
- Steam sawmill 100m southeast;
- Depot 120m east;
- Smithy 120m west;
- Brewery 120m northeast;
- Tanks 150m southeast;

- Surgical appliance factory 150m southeast;
- Laundry 200m southeast;
- Brewery (including tanks and chimney) 200m northeast;
- Furniture factory 230m west;
- Telephone exchange 230m west;
- Telephone exchange centre 240m east;
- Agricultural works 250m east;

There are further entries present, but these are considered far enough from the site to pose no risk. Where more than one land use is identified, only the closest is listed above.

The following off site sources have been identified from the site walkover:

- Commercial properties surrounding the site on its north, east, and southern flanks.

The following possible off site sources have been identified from the Enviro + Geo Insight data:

- Warehouse 3m north;
- Arms and ammunition works 15m east;
- Electrical sub-station 81m northeast;
- Print works 65m north;
- Unspecified tank 173m southwest; and
- Unspecified works 203m southeast.

Sources Summary

The *main sources* of potential contamination that have been identified at the site or in the vicinity of the site are summarised below:

Source	Location	Description
Historical development including garage use	On site	Likely use of hydrocarbon based products. A wide variety of contaminants are associated with these types of land use. TPH, PAH, heavy metals, VOCs, SVOCs, and Asbestos, are all associated with these types of land use.
Warehouse	On and off site	Possible storage and distribution of a range of contaminative materials.
Garage / fuel station / repair depot and other commercial uses in surrounding area	Off site	Likely use of hydrocarbon based products. A wide variety of contaminants are associated with these types of land use. TPH, PAH, heavy metals, VOCs, SVOCs, and Asbestos, are all associated with these types of land use.
Ammunition works	Off site	Possible explosives storage and distribution however activities likely to have been closely controlled due to safety risk in built up area.
Print works / unspecified works / builders' yard / timber yard / engineering works / furniture factory / agricultural works/sawmill/sewage works/brick works	Off site	Determinants such as TPH, PAH, heavy metals, VOCs, SVOCs, and Asbestos may be associated with these land uses.
Electrical sub-station	Off site	PCB's are the most common determinant associated with this land use. However, these are highly immobile so the distance from site makes it unlikely to be a source.

Tanks	Off site	Due to the wide variety of products that can be stored within tanks, there is a broad spectrum of contaminants associated with them.
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Table 7.1: Sources Summary

The following contaminants are potentially associated with the on-site sources:

- Heavy Metals;
- TPH;
- PAH;
- VOCs;
- SVOCs; and
- Asbestos.

The following contaminants are potentially associated with the off-site sources:

- Heavy Metals;
- TPH;
- PAH;
- VOCs;
- SVOCs;
- Asbestos.

In practice, a broad contaminant screen should be analysed for in any intrusive investigation recommended to ensure that potential contaminants are not omitted.

8.0 Possible Pathways and Receptors

Pathways

In order for contaminants to reach potential receptors, there has to be a viable **pathway** for the contaminant. Potential pathways that may affect the migration of contaminants are listed below:

Pathway	Medium	Properties
Direct Contact	Dust, solid and liquid phase	There may be direct contact with potentially impacted soil and Made Ground across the site. There is a possibility of dust fumes being produced during earthworks in the construction phase. Dermal contact and ingestion of potentially contaminated soils during construction or operational phase of the site.
Leaching through Made Ground	Unsaturated flow	Potential for leaching and migration of potential contaminants along preferential flow paths in the ground.
Foundations and Underground Infrastructure and Obstructions	Preferential flow	New deep foundations are not proposed therefore no potential to create new pathways.
Migration of Ground Gas.	Gaseous flow	Migration through granular material within bedrock deposits is possible however bedrock permeability stated to be low.

Table 8.1: Pathways

Receptors

The site specific **receptors** that could be potentially affected by the contamination hazards identified during this preliminary appraisal are summarised below:

Category	Receptor	Properties
Humans	End users (such as residents and visitors)	Potential contact with contaminated soils in existing/proposed soft landscaping areas, however the proposed plans show no soft landscaping. Potential contact with vapours within enclosed buildings is possible given the previous land use.
	Construction workers	Reworking of contaminant impacted materials in underlying soil during construction works can expose workers to contamination.
Property	Materials and site structures	Foundations and site services may be damaged by potentially aggressive compounds present in soils.
Controlled Waters	Underlying superficial / bedrock Aquifer and surface water	The site is recorded as having a Secondary (Undifferentiated) Aquifer within the bedrock underlying the site, however the permeability is stated to be low. There are no proximate surface water bodies or groundwater abstractions and the site is not within a source protection zone.
Plant (species and uptake) and Wildlife	Various	Attributes will be influenced by factors such as relative quality, scale, rarity and substitutability; however, the proposed plans show no soft landscaping.

Table 8.2: Receptors

9.0 Qualitative Risk Assessment

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed above. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways.

This qualitative risk assessment has been undertaken in accordance with Annex 4 of the National House Building Council/Environment Agency/Chartered Institute of Environmental Health R&D publication 66, Guidance for the Safe Development of Housing on Land Affected by Contamination (NHBC/EA/CIEH, 2008) which updates and supersedes CIRIA C552: Contaminated Land Risk Assessment, A Guide to Good Practice (Rudland et al., 2001).

An assessment of the likelihood of the risk being realised and the magnitude of potential risk is presented below to give an estimation of the significance of each potential pollutant linkage identified. Where it is considered that there is no credible linkage, this is indicated in the table. In accordance with the R&D66 guidance, if there is no pollution linkage then there is no need to apply tests for probability and consequence.

The assessment is undertaken based on the current proposals for the site, at the time of issuing this report, which would be classed as a generic end land use of 'residential (without consumption of homegrown produce)'. Any change in the development proposals for the site involving a change in end use class may result in a requirement for this assessment to be revised.

10.0 Preliminary Conceptual Site Model

Contaminant Source	Pathways	Receptor	Potential Severity	Probability of Risk	Level of Risk	Justification
On Site: Made Ground soils on site possibly containing elevated metals, other organics such as TPH, PAH, and phenols.	Ingestion, dermal contact, inhalation of dusts/vapours	Future end users and site visitors	Medium	Low Likelihood	Moderate/Low ●●	There is a history of potentially contaminative land uses on site. However, the proposed plans indicate the site is to be hard surfaced with no areas of soft landscaping. There is a potential for vapour ingress if volatile hydrocarbons are present in the ground however this is considered a moderate/low risk.
		Construction Workers	Medium	Likely	Moderate ●	Construction workers are likely to come into direct contact with soils during groundworks. Safe working practices should be implemented and appropriate personal protective equipment (PPE) should be used to mitigate any potential risk from contact with soils and shallow/perched groundwater.
	Leaching through soils and migration via groundwater or soil pore moisture	Controlled Waters	Mild	Low Likelihood	Low ●	A low risk rating has been assessed due to the presence of potentially contaminative sources on site and the presence of a Secondary (Undifferentiated) Aquifer within the bedrock underlying the site. There are no proximate surface water bodies or groundwater abstractions and the site is not within a source protection zone.
	Permeation of water pipes	Construction materials, future end users and site visitors	Medium	Low Likelihood	Moderate/Low ●●	Hydrocarbons, especially aromatics are known to permeate plastic pipes. Provision of water supply pipes and connectors formed from proprietary “barrier pipe” materials (eg polyethylene-aluminium-polyethylene) may be required by the water supply company.
	Uptake	Plant and Wildlife	n/a	n/a	No Linkage ●	No linkage is identified as there are no indicated areas of soft landscaping on the proposed site plans.
On Site: Asbestos at/near ground surface in Made Ground soils.	Inhalation of fibres in airborne dust	Future end users and site visitors	Medium	Unlikely	Low ●	There is a history of potentially contaminative land uses on site. However, the proposed plans indicate the site is to be hard surfaced with no areas of soft landscaping therefore, a low risk has been assessed.
		Construction Workers	Medium	Low Likelihood	Moderate/Low ●●	Although no potentially asbestos containing materials (PACM) were observed during the walkover, the potential for PACM within near surface soils can not be discounted. During groundworks, safe working practices should be implemented and appropriate personal protective equipment (PPE) should be used to mitigate any potential risk from residual asbestos in soils.
On Site:	Gas migration and build up	Future end users and	Medium	Unlikely	Low ●	A low risk rating has been assessed due to lack of evidence of made/infilled ground underlying the site.

Ground Gases (CH4, CO2) from on site Made Ground.	within buildings (explosion/asphyxiation risk)	building structures.				
Off Site: Historical land uses and activities, Made Ground/infilled material possibly containing elevated metals, other inorganics, TPH, PAH, and phenols.	Leaching through soils and migration via groundwater or soil pore moisture	Future end users and site visitors	Medium	Unlikely	Low ●	Given the low permeability of the underlying geology and hydrogeology, there would be a low risk for the leaching of contaminants. Furthermore, due to the site being 100% hardstanding there is no pathway to future site users.
	Ingestion, dermal contact, inhalation of dusts/vapours	Future end users and site visitors	Mild	Unlikely	Very Low ●●	A very low level of risk rating has been assessed as the potentially contaminative land uses/activities in proximity to the site have been subject to redevelopment and are now predominantly hard surfaced.
Off Site: Ground Gases (CH4, CO2, H2S) from off site historical landfilling activities.	Gas migration and build up within buildings (explosion/asphyxiation risk)	Future end users and building structures.	Medium	Unlikely	Low ●	A low risk rating has been assessed due to lack of evidence of landfills or made/infilled ground in areas surrounding the site.

Table 10.1: Preliminary Conceptual Site Model

11.0 Recommendations

11.1 Proposed Site Investigation

Based on the information obtained for formation of this report, we would recommend that an intrusive contaminated land investigation is undertaken to determine the actual pollution linkages and to quantify the risk to the receptors as outlined with the Preliminary Conceptual Site Model.

The intrusive investigation may reveal on-site sources of contamination that were not established by the Phase I Desk Study and Site Walkover and thus require modification of the conceptual site model.

The proposed scope of investigation is outlined below.

Scope of Proposed Investigation

Testing Regime

The testing regime has been devised in accordance with BS10175:2017 Guidelines for the Code of Practice for Contaminated Land and CLR Report No. 4 Sampling Strategies. The objective at this stage of the report is to attempt to identify the extent of any possible contamination that may exist at the site by using intrusive soil sampling and testing techniques.

Sampling Strategy

A service search should be completed prior to any subsequent investigation to determine the service locations by lifting up any manhole/drain covers; therefore, locations may be subject to change depending upon these results.

The SI should incorporate the drilling of three (3no.) window sampler boreholes in order to gain a suitable spread of the site and enable adequate analysis of the soil conditions. This will be completed to a maximum depth of 4-5 metres below ground level (mbgl) or refusal or where groundwater is encountered.

All positions should be logged, and samples removed in accordance with current protocol. In addition, groundwater conditions, if encountered, shall be logged and visual/olfactory observations noted.

If groundwater is encountered would recommend that two (2no.) of the windowless sample holes are installed with monitoring standpipes in order to recover groundwater samples and quantify potential groundwater risks.

We would recommend that the test locations be based on the findings contained with this report, to enable a broad coverage of the site.

Monitoring Regime

The installed positions should be monitored for groundwater if encountered. Two monitoring rounds should be allowed for, commencing approximately 7-10 days after completion of the holes to enable equilibration of the underlying soils and groundwater.

Laboratory Analysis

An appropriate and consistent analytical suite of contaminants should be applied to any soil samples retrieved from the site.

Based on the findings contained within this report, we would recommend that a comprehensive range of testing should be undertaken to comprise of heavy metals, speciated Total Petroleum Hydrocarbons (TPH CWG Aromatic/aliphatic split) and speciated Polycyclic Aromatic Hydrocarbons (PAH) including the more carcinogenic benzo(a)pyrene (BaP) and naphthalene, soil organic matter (SOM) content, pH, and sulphates.

In addition, selected samples retrieved from the Made Ground, if encountered, will also be submitted for a screen to determine the presence, or otherwise, of asbestos.

It should be noted that not all samples retrieved from the proposed investigative works will be laboratory analysed and a UKAS and MCERTS accredited laboratory testing organisation should carry out all analysis.

Guidance

The results from the proposed SI shall be compared against standards, such as the revised LQM/CIEH S4UL criteria¹ where available.

11.2 Consultees

It is highly recommended that this report be forwarded to the relevant Local Authority Environmental Health and Planning Departments to seek their comments and subsequent approval, otherwise further works may be required.

11.3 Groundworks Watching Brief

If during construction works any material is noted to show visual and/or olfactory signs of contamination an environmental consultant should be contacted to supervise/guide further works.

If any landscaping materials are to be imported on site they should be tested to check that they are suitable for the intended use.

11.4 Flood Risk Assessment

This report does not replace a full hydrogeological survey and specialist studies may need to be undertaken to ascertain the risks posed from flooding. Further details on site flood information can be found within the appendices.

12.0 Limitations and Uncertainties

This report has been prepared by YE with all reasonable skill, care and diligence. The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources, together with a site walkover inspection of the site.

¹ Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3495

The opinions given in this report have been dictated by the finite data on which are they based and are relevant only to the purpose for which the report was commissioned.

Information reviewed should not be considered exhaustive and accepted in good faith as providing true and representative data with respect to site conditions. Should additional information become available which may influence the opinion expressed in this report, YE reserves the right to review such information and, if warranted, to alter the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site. This report is an environmental phase 1 report and does not consider the geotechnical implications for the site, its redevelopment and proposed future use. Further advice should be sought on geotechnical investigation requirements for the proposed development.