



Stage 1: Desktop Study & Walkover Survey

at

**KAO Business Park,
London Road,
Harlow,
CM17 9NA**

for

Harlow Properties Ltd

DOCUMENT APPROVAL***Report Author(s)***

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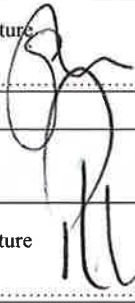
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REPORT REVISED (response to significant changes in client requirements, methods of work etc).

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TRADING TERMS

Unless specifically stated within the tender/quotation or unless identified within the introduction to this report it is confirmed that this report has been compiled wholly in accord with Constructive Evaluation Limited's terms of engagement.

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The following notes should be read in conjunction with the report. Any variation to the general procedures outlined below are indicated in the text.

Foreword

The recommendations made and opinions expressed in the report are based on the conditions revealed by the site works as indicated on the site record sheets, together with an assessment of the data from the insitu and laboratory testing or in respect of the desktop reports. No responsibility can be accepted for conditions that have not been revealed by the research, for example, due to inaccuracies in the data. While the report may offer opinions, these comments are for guidance only and no liability can be accepted for their accuracy.

Routine Sampling

During the site investigation, soil, water and leachate samples have been taken in accordance with recommendations within BS.5930: 1990, & BS.10175: 2011. All samples have been marked accordingly, and stored under suitable conditions to prevent any deterioration of the specimen (e.g. volatilisation of hydrocarbons). All samples have been placed in suitably labelled sealed plastic containers and sampling equipment cleaned between sample locations to prevent possible cross contamination.

During the compilation of desktop studies a number of sources have been contacted in order to provide any relevant information regarding the site in question. The sources contacted provide their own Terms & Conditions with regard to the data provided. As such, each source, e.g. Sitescope, Council Websites, etc. must be considered only in relation to these individual Terms & Conditions. All research has been carried out in accordance with recommendations within BS.10175: 2011.

The method of construction employed to form trial pits is entered on their records. In general, it is not possible to extend machine excavated trial pits to depths significantly below the local water table, especially in predominantly granular soils. Except for manually excavated pits, and unless otherwise stated, the trial pits have not been provided with temporary side support during their construction, hence personnel have not entered them and examined the strata or any construction details so exposed.

Laboratory Testing

Unless stated otherwise within the text, all laboratory tests have been performed in accordance with the requirements detailed in British Standards 1881:1990 or other standards or specifications that may be appropriate.

Regulatory Bodies

After the compilation of desktop study and walkover survey or site investigation works all parties must communicate with regulatory bodies including the Local Authority (both Planning & Environmental Health) and the Environment Agency. It must be accepted that further requirements may develop. It is possible that aspects of desktop study may need to be altered to conform to the requirements of the regulatory bodies.

Definitions

Reference to the word "contamination" in this report does not relate to the statutory definition of contaminated land under 1990 Environmental Protection Act unless otherwise stated. The definition used in this report is: "Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets" (NATO CCMS, 1985).

Walkover Survey

It should be noted that a walkover survey is designed as a brief inspection of the site in question, however every reasonable effort has been made to access all areas of the site, areas where this has not proved possible will be referenced in the text. The site reconnaissance is undertaken with permission of the client after the document search is completed with the aim of recording any further aspects of the site not revealed by the desktop study however this does not in itself guarantee that every possible risk has been seen.

Conceptual Model/Risk Assessment/ Sampling Regime

The conceptual model, Risk assessment and sampling regime has been formulated in accordance with BS10175:2011 and CLR 8 based upon the relevant information gained from the desktop and walkover survey. While the model and assessment offer opinions and interpretations of these guidelines, the comments made are for guidance only and no liability can be accepted for their accuracy.

Restrictions

In some instances a site investigation must be separated into two stages, depending on the access to the sub soils at the time of the initial site attendance. It must also be noted that in many instances the access afforded is restricted due to continuing activity on the site. In such instances all reasonable effort were to achieve maximum sampling coverage. This does not imply a guarantee that inaccessible areas are similar.

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1.0 INTRODUCTION

Constructive Evaluation (CE) Limited were instructed by Harlow Properties Ltd (the Client) (EQ9037rev.2, 27th February 2014) to carry out a Stage 1: Desktop Study and Walkover Survey at a site known as KAO Business Park, London Road, Harlow, CM17 9NA.

The site is currently occupied by light industrial/office units with associated car parking and areas of softscaping. It is understood that proposals for the site include the demolition of several existing buildings with new offices to be constructed, however proposed plans have not been made available to CE at the time of writing.

The client instructed CE to undertake an environmental risk assessment to enable determination to the potential source – pathway – receptor linkages associated with the site and surrounding environs historical and current context. This will help to formulate a suitable targeted Site Investigation in the future if required.

The purpose of the Desktop Study was to provide information on:

- The expected geology & hydrogeology.
- The development history and most recent use.
- Potential sources of contamination.
- To enable the development of a Conceptual Site Model (CSM) and risk assessment.

This report presents results of the assessment, including historical Ordnance Survey maps and published geological & hydrogeological maps, as well as information from various sources such as Centremaps.

The report has been formulated in accordance with BS10175:2011:2013+A1 *Investigations into Potentially Contaminated Sites – Code of Practice* and CLR11 – *Model Procedures for the Management of Land Contamination*, and from Planning Policy Statement (PPS) 23 – *Planning & Pollution Control*.

2.0 PHYSICAL SETTING

The following observations are taken from published maps, which can be reviewed within Appendix B.

The site is located to the east of Harlow and is centred on a National Grid Reference (NGR) 547014, 210048 with a site area of approximately 10.95 hectares (Ha).

2.1 Geology

The relevant 1:50,000 British Geological Survey Map 240 (Epping) indicates the majority of the site to be on superficial deposits of the Lowestoft Formation with an area in the south on Head Deposits, underlain by the London Clay Formation.

Lowestoft Formation: forms an extensive sheet of chalky till, together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. The carbonate content of the till matrix is about 30%, and tills within the underlying Happisburgh Formation have less than 20%.

Head Deposits: are comprised of gravel, sand and clay depending on the upslope source and distance from that source. The deposits are poorly sorted and formed mostly by solifluction, hillwash and soil creep.

London Clay Formation: typically consists of dark bluish to brownish grey, stiff heavily fissured Clay, containing variable amounts of fine grained sand and silt (particularly at the top and base of the deposit), weathering to orange brown clay near surface.

Geological Hazards – On site there is a moderate risk from shrink swell, a low risk from landslides, a very low risk from collapsible rocks and running sand, a negligible risk from compressible ground, and a null-negligible risk from soluble rocks.

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

Borehole Records – Several boreholes were drilled to 3.0mbgl in the 1950's completed within 30-249m west and northwest of the study site. The closest of these encountered topsoil to a depth of 0.1mbgl, underlying this was very soft light brown clay to 0.7mbgl and beneath this the soils were recorded as hard brown chalky clay to a maximum drilled depth of 3.0mbgl.

2.2 Environmental

2.2.1 Hydrogeology

Aquifer within Superficial Deposits –

Lowestoft Formation (Unproductive) – rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Head (Secondary Undifferentiated) – has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Aquifer within Bedrock Deposits –

London Clay Formation – The site is underlain by unproductive strata which are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Groundwater Abstraction Licences – The only record within 2000m is located 1294m northwest for pollution remediation.

Surface Water Abstraction Licences – There are no records within 2000m.

Potable Water Abstraction Licences – There are no records within 2000m.

2.2.2 Hydrology

Detailed River Network – Within 500m there are thirteen records, the closest of these are listed in the table below;

<i>Distance</i>	<i>Direction</i>	<i>Name</i>	<i>Type</i>
0m	On site (southwest)	Todd Brook	Tertiary River
1m	South	Todd Brook	Primary River
4m	Southeast	Todd Brook	Tertiary River
5m	Southeast	Todd Brook	Culvert
218m	Southeast	Todd Brook	Tertiary River
255m	West	Todd Brook	Primary River

Surface Water Feature – Of the three records within 250m the closest are 2m south and 57m west, these are both considered to be for Todd Brook.

Flooding – Within 250m of the site there are no Zone 2 or Zone 3 floodplains, no flood defences and no areas benefiting from flood defences. To the immediate southeast of the site is an area used for flood storage. On site there is considered to be a risk from groundwater flooding.

3.0 SITE CONDITIONS

3.1 Site Description

An Environmental Scientist from CE completed a walkover survey on 31st March 2014.

The site is generally made up of three areas, an undeveloped bank of grass to the south, central car park facilities and, offices and laboratories in the north.

It is accessible by vehicular and pedestrian means along the south eastern boundary off London Road via security gates, leading into the car park which occupies the centre of the site. There are three sections within the main car park, an area of open-jointed brick paving, a similar sized area of tarmac spaces and a multi-storey car park to the west.

The multi-storey car park is unused and at the time of the walkover was surrounded by cones and signs warning that it was used for police dog training.

The grassed area to the south of the car park appeared to have been landscaped and sloped down towards the south. The southern boundary was lined in trees with an electrical substation noted within brick housing amongst these trees in the southeast corner.

The northern portion of the site comprises of various aged office blocks and laboratories, which were largely vacant. There are areas of softscaping in between the blocks which are interconnected with covered walkways and bridges. Vehicular access is made via secure gates in the west with concrete security blocks preventing access to the east. Several single lane roads allow vehicular movement around the site.

Pertinent features are numbered on the map and are described below;



1. Located within this area are several electrical substation transformers which are currently supporting the site. These were generally in good condition within a fenced off area and surfaced in concrete. Within a concrete shed were two barrels of diesel partially submerged within a pool of trapped water. Also within this area were signs warning of caustic material, however the infrastructure associated with these had been removed.

2. Behind the aforementioned substation was the associated enclosed main switch room, however, access was not permitted during the walkover.

3. This area was considered to be used as a delivery site with larger shutter doors providing access into the ground floor of one of the laboratories. Within a number of out houses and sheds around this entrance were a variety of plastic bottles, most of which were considered to contain oil, minor staining was noted on the tiled floor beneath.
4. Another electrical substation is located within this area in brick housing and an external fenced off area. This appears to be relatively modern with a clear service duct running out to the south.
5. Several 'gas huts' and an electrical substation are situated along the access road. The huts appear to have housed equipment and gauges for controlling and monitoring gas for the various facilities. These had been extensively decommissioned and many parts appeared to be missing.
6. Within a main building to the east a gas boiler room was present, again this appeared to be no longer active.
7. A large amount of services, generally electrical, were noted within the vicinity of the three single storey brick offices/workshops in this area of the site.
8. An above ground diesel tank and fuel stores were noted on the western edge of the site in a storage area. The diesel tank was sat on a 1300l catchment tank which was full of water with a slight sheen. This was positioned on both concrete and tarmac surfaces which was covered in leaves obscuring any potential staining from leaks and spills.
9. Within this area a 194m³ water tank is located next to a waste storage area and an electrical facility. This all appeared to be in good condition on a concrete slabs.
10. This block is currently the only active office on site, it is a modern three storey building of glass and concrete construction.
11. To the north of the site is an area used for waste storage, this is largely in bins and crates and comprises electrical products/components.

3.2 Surroundings

To the immediate northwest of the site is Markhall Wood with the A414 running north-south through it. The south, east and west is generally comprised of houses and grassed open spaces with a school and Tesco store is located to the southeast.

Photographs relating to the above plan from the walkover can be reviewed within Appendix A.

3.3 Potential Sources of Contamination - Walkover Survey

On-Site

- Diesel tank in the west
- Numerous electrical substations
- Various bottled fuels
- Historic use of laboratories and associated activities

Off-Site

- No sources identified

3.4 Site History

The following observations are made based on the available historic map extracts presented in Appendix B of which the most salient points have been discussed in relation to the site and surrounding environs.

<i>Date</i>	<i>Observations</i>	<i>Potential Contaminants</i>
1874	The earliest available map shows the site to be largely on undeveloped land considered to be for arable use. The northwest corner of the site is covered by woodlands labelled as Markhall Wood, this area also contains a single building of unknown use. Several paths dissect the site, a road runs along the eastern boundary in generally a north-south orientation and a stream runs along the southern boundary. The surrounding area comprises of woodlands, farm land and rural pockets of residential dwellings.	-
1896-1847	The site and surrounding area show no significant changes.	-
1955	The site remains unchanged. There has been large scale residential expansion beyond the 300m periphery to the northwest associated with Harlow.	-
1962	The site remains unchanged. The A414 has been constructed 15m west in a north-south orientation.	-
1966	An unspecified works has now been constructed within the north of the site, this is an irregular shaped building which is considered to be part of the layout of buildings currently on site. There are a number of ancillary structures associated with the works however specific uses are not labelled. An access road for the works joins up with London Road on the southeast boundary. Tennis courts, a pavilion and playing are now present to the immediate northeast.	On Site – Works

<i>Date</i>	<i>Observations</i>	<i>Potential Contaminants</i>
1974	The site and surrounding area show no significant changes.	-
1980-1982	The site remains unchanged. There has been further residential development to the south beyond the 500m periphery.	-
1993-1995	The works on site are now labelled as a laboratory. A complex of other buildings has now been constructed within the vicinity of the existing building now occupying most of the northern portion. The largest of the new buildings is also labelled as a laboratory and at least four tanks are also present. A car park servicing the laboratories has been built across the centre of the site. Off site a balancing lake has been excavated 20m southeast.	On Site – Laboratories and associated tanks
2002	A multi-storey car park has been built in the west and landscaping to the immediate south of both car parks is now present on site. Further development associated with Harlow has now reached 100m southeast of the site.	-
2012	Several buildings within the north of the site have been replaced by a larger single 'L' shaped block considered to be offices. Additional car parking has been laid to the south of the existing area and an electrical substation is present on site at the very southern edge.	On Site – Electrical Substation

3.5 Potential Contamination Sources – Historical

On Site:

- Works and laboratories
- Tanks
- Electrical substation

Off Site:

- None Identified

3.6 Information on Public Record

The following information has been obtained from public archive via the data supplier Centremaps or by direct application. The full Centremaps report is presented in Appendix C.

Public Record Information	Potential Contaminants																								
<u>Environment Agency Licensed Waste Sites</u> – The only record within 1500m is located 1439m northwest for Harlow Waste Transfer Station.	-																								
<u>National Incidents Recording System, List 2</u> – The only record within 500m is located 208m southeast with the pollutant described as ‘inorganic chemicals/product – acid’. This had a Category 4 (No Impact) effect on water, land and air.	-																								
<u>Part A (2) and Part B Activities</u> – Within 500m there are six records, one of these, a Part B Activity, is on site for the company Nortel undertaking fibre optic cable manufacturing, no enforcements are listed. Two other sites are listed as being on site, however, these actually appear to be records for a BP petrol station located approximately 3000m south. The next record is a filling station at a Tesco store located 164m southeast.	On Site – Fibre optic cable manufacturing. Off Site – Petrol filling station																								
<u>IPC Authorisations</u> – There are five records within 500m, four of these are on site for Nortel Networks Optical Components Ltd with the process described as ‘other mineral fibres’, the dates for these range from 1993 to 2000. The other record is registered 7m southwest (considered to be for on site) for Nortel Technology Ltd for ‘inorganic chemical processes’ for 1995.	On Site – Processes involving mineral fibres and inorganic chemicals.																								
<u>Potentially Contaminative Industrial Sites</u> – There are ten records within 250m, those considered pertinent are listed in the table below; <table><tr><th>Distance</th><th>Direction</th><th>Activity</th></tr><tr><td>0m</td><td>On Site</td><td>Electrical Components (industrial products)</td></tr><tr><td>0m</td><td>On Site</td><td>Tanks (generic)</td></tr><tr><td>0m</td><td>On Site</td><td>Tanks (generic)</td></tr><tr><td>0m</td><td>On Site</td><td>Electrical Substation</td></tr><tr><td>128m</td><td>East</td><td>Electrical Substation</td></tr><tr><td>139m</td><td>Southeast</td><td>Carwash</td></tr><tr><td>151m</td><td>Southeast</td><td>Petrol Station</td></tr></table>	Distance	Direction	Activity	0m	On Site	Electrical Components (industrial products)	0m	On Site	Tanks (generic)	0m	On Site	Tanks (generic)	0m	On Site	Electrical Substation	128m	East	Electrical Substation	139m	Southeast	Carwash	151m	Southeast	Petrol Station	On Site – Electrical substations and tanks Off Site – Electrical substation, car wash and petrol station
Distance	Direction	Activity																							
0m	On Site	Electrical Components (industrial products)																							
0m	On Site	Tanks (generic)																							
0m	On Site	Tanks (generic)																							
0m	On Site	Electrical Substation																							
128m	East	Electrical Substation																							
139m	Southeast	Carwash																							
151m	Southeast	Petrol Station																							
<u>Ancient Woodlands</u> – On site is recorded as being within Markhall Wood which is listed as ancient and semi-natural woodland.	-																								

<i>Public Record Information</i>	<i>Potential Contaminants</i>
<u>Nitrate Vulnerable Zone (NVZ)</u> – On site is recorded as an NVZ.	-
<u>Local Nature Reserve (LNR)</u> – The only record within 2000m is located 1893m northwest for Harlow Marsh.	-
<u>Historical Surface Ground Working Features</u> – There are two records within 250m, the closest of these is for an unspecified pit located 223m northeast.	-
<u>Current Ground Workings</u> – Within 1000m there are seven records, the closest of these is located 301m northeast for a gravel pit.	-

4.0 PRELIMINARY CONCEPTUAL SITE MODEL & RISK ASSESSMENT

The Conceptual Site Model has been formulated in accordance with BS10175:2011:2013+A1, it assesses the significance of the environmental hazards identified at the site, the potential receptors and the pathway between them.

4.1 Sources

4.1.1 On Site

The on site potential sources have been identified as:

- The tank identified during the walkover to the west of the site.
- The past use of the majority of the site as a laboratory (and unspecified works c.1966) is considered to present a largely site with potential risk from the light industrial nature of the works supported by the findings of the walkover study. This includes the bottled fuels, plant and vehicle movement/spills, and the historic tanks. In addition the fibre optic cable manufacturing and IPC Authorisations records identified within the public record search are considered to be part of this source.
- Asbestos Containing Materials (ACM) were not noted during the walkover, however, it is considered that given the period of time that works have been located on site it is considered that there is the potential for ACMs to be present.

The various electrical substations have not been considered further given that these appear relatively modern (post 1980) and are all installed on concrete slabs/surfaces. In addition the low mobility of the associated contaminant PCB would inhibit the extent of any impact on the underlying soils.

4.1.2 Off Site

Those sources previously identified within the historic map and public information review which have not mentioned in this section are considered to be at a distance to great to present a significant risk to site.

4.2 Receptors

4.2.1 On Site

- End Users – Employees of the proposed business park development.
- Site Workers – All workers that are involved in ground and demolition works are likely to come into contact with soils.
- Proposed Development – Vapour from impacted soils and soil gas may accumulate in confined, poorly ventilated areas of the proposed builds. This also includes attack from sulphates on buried concrete structures.
- Services – Any buried services installed for the proposed development.
- Surface Water – Todd Brook on the southern edge of the site.
- Groundwater – The Head Deposits to the south of the site is listed as a Secondary Undifferentiated Aquifer.

Given that the Lowestoft Formation and London Clay Formation are recorded as unproductive strata these will not be considered further as groundwater receptors. In addition there are no abstractions within 1.2km.

4.2.2 Off Site

- The ancient woodlands to the immediate northwest are considered to be a receptor given the sensitive nature of the woodlands.

4.4 Conceptual Site Model

The CSM has been formulated to provide information regarding the possible sources of contamination on site, the pathway in which the contamination can migrate and vulnerable receptors to the contamination, all of which need to be present for there to be a risk based on the current and proposed commercial land use of the site.

<i>Source</i>	<i>Pathway</i>	<i>Receptor</i>	<i>Potential Risk</i>
On site hydrocarbons (PAH, TPH, BTEX and MTBE) and heavy metals from current fuel tank located in the west of the site.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users.	Low risk due to the limited size of the potential source and that the proposed end use of the development as a business park means that exposure to soils will be minimal. However, if proposals include areas of softscaping within this area the risk may be increased.
		Site workers.	Moderate risk given that the proposed development is to be completed within the vicinity of the tank and that site workers will be in direct contact with soils. The appropriate use of PPE will reduce this risk.
	Impacted Soils.	Services.	Low risk, given the limited potential sources identified, however depending on the location of installations pipework could be at risk from degradation.
	Volatilisation of hydrocarbons from the underlying soils to indoor and/or outdoor air.	End user and buildings.	Low risk given the limited size of the potential source, however, if impacted soils are identified then suitable measures may be required to reduce the risk as proposed developments are located within this area.
		Site workers.	Low risk given the limited time that that workers will be on site and the appropriate use of PPE during works.
	Infiltration and migration of contaminants through the underlying soils.	Secondary Undifferentiated Aquifer	Negligible risk given the distance from the tank to the aquifer located in the south of the site.
		Ancient Woodlands	Low risk given that the receptor is located off site, however, given that the tank is within close proximity to the woodlands it is considered that a pathway exists.

<i>Source</i>	<i>Pathway</i>	<i>Receptor</i>	<i>Potential Risk</i>
On site hydrocarbons (PAH, TPH, BTEX and MTBE) and heavy metals from historic laboratory/works with associated processes.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users.	Low risk given that limited specific sources identified and that the proposed use is for a business park, however, there are currently areas of softscaping and the proposed development is likely to include these which will increase the potential for exposure.
		Site workers.	Moderate risk given that site workers will be in direct contact with soils during ground works, however, the appropriate use of PPE will reduce this risk.
	Impacted Soils.	Services.	Low risk, given the limited potential sources identified, however depending on the location of installations pipework could be at risk from degradation.
	Volatilisation of hydrocarbons from the underlying soils to indoor and/or outdoor air.	End user and buildings.	Low risk given the limited specific sources and that the proposed end use is a business park which will limit the time end users are exposed to any contaminants.
		Site workers.	Low risk given the limited time that that workers will be on site and the appropriate use of PPE during works.
	Infiltration and migration of contaminants through the underlying soils.	Secondary Undifferentiated Aquifer	Low risk given that the Secondary Undifferentiated Aquifer is only present within the south of the site located away from the laboratory/works.
		Ancient Woodlands	Low risk given that the receptor is located off site and is confined to the northwest of the site.
Asbestos Containing Materials located within onsite laboratory/works.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End users.	Low risk given that ACMs should be removed during the demolition process, however, there is still considered to be a risk from any mixing of soils or impacted Made Ground.
		Site workers.	Moderate risk given that site workers will be in direct contact with soils during ground works, however, the appropriate use of PPE will reduce this risk.

Negligible Risk	Defined as the site should be considered suitable for the present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.
Low Risk	Defined as the site should be considered suitable for the present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.
Moderate Risk	Defined as the site may not be suitable for the present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.
High Risk	Defined as the site is probably or certainly not suitable for the present or future use and environmental setting. Contaminants are probably or certainly present and likely to have unacceptable impact on key targets.

5.0 CONCLUSIONS

This Stage 1 Desktop and Walkover Survey has identified limited specific sources of potential contamination on and off site that are considered to present risks to the various receptors. However, given the lack of knowledge regarding details of the historic operations and processes on site it is considered that there is the potential for shallow soils to have been impacted over the years. This is considered to be limited to the centre and north of the site where the laboratory/works have been present and ancillary processes will have taken place.

The risk to future end users, services, groundwater and future developments is generally considered to be **Low** and the risk to site workers is considered to be **Moderate**. These risk categories are based on the presence of an above ground diesel tank in the west of the site and uncertainties concerning the impact that the historic laboratories/works will have had on the underlying soils. The appropriate use of PPE would lower the risk to site workers during ground works

Given the risk of **Low** and **Moderate** for asbestos it is considered that if it is identified within the buildings during redeveloped then it should be suitably assessed and dealt with a qualified surveyor prior to demolition works.

As such a Site Investigation should be completed in order to assess the condition of the site and risk it presents to the identified receptors. This should comprise of targeted soil testing within the area of the diesel tank and a general screen of testing across the central and northern portions of the site where the laboratories/works have historically been active.

The results of this investigation will allow the risks to the identified receptors to be refined further by increasing knowledge of the site.

6.0 RECOMMENDATIONS

From the information contained within this report the following recommendations have been formulated.

6.1 *Proposed Site Investigation*

It is understood that a Site Investigation for geotechnical purposes is to be completed and as such it is considered that contamination testing should be completed in conjunction in order to address the risks outlined within the CSM.

It is considered that a series of shallow window sample boreholes should be completed across the central and northern portion of the site to allow the ground conditions to be observed and soil samples to be collected for laboratory analysis. This will also confirm the presence and depth of any Made Ground.

Soils samples should be tested for contaminants identified within this report, as well as a basic suite of other determinands, with shallow soils being primarily targeted with a selection of deeper samples to prove conditions with depth. Sample analysis should also be based on any evidence of contamination observed made during the works.

6.1.1 Testing Regime

The testing regime has been devised in accordance with BS10175:2011:2013+A1 *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 delineate the extent of any contamination at the site by using intrusive soil sampling and testing techniques.

6.1.2 Analysis

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

Based on the findings contained within this report, we would recommend that testing should comprise of a site specific screen to include: heavy metals, speciated Total Petroleum Hydrocarbons (TPH – aliphatic and aromatic C₅ – C₄₀), speciated PAH (including the more carcinogenic forms of naphthalene and benzo(a)pyrene), BTEX, MTBE, phenols, sulphates, pH and Soil Organic Matter.

Selected samples within Made Ground being screened for the presence of asbestos fibres.

A UKAS and MCERTS accredited laboratory will be appointed to undertake all of the soil testing.

6.1.3 Guidance

The results from the Site Investigation will be compared against UK guidance including Soil Guideline Values (SGVs) and LQM CIEH Generic Assessment Criteria using the ‘commercial’ classification given the continuing land use.

6.2 Statutory Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Environment Agency (EA) and Local Council’s Environmental Health and Planning Department to seek their comments and subsequent approval.

6.3 Flood Risk

This report is not intended to replace a full hydrogeological survey and it is recommended that additional specialist studies be conducted to confirm potential flood risks at the site.

6.4 Watching Brief

We would recommend that a watching brief is maintained on site this must be undertaken as part of good working practices and in case there are any areas of unidentified contamination.

During any ground works an appraisal of the exposed soils should be made by the on-site manager. If any material is noted to show visual and/or olfactory sign of contamination this material should be stockpiled separately and tested prior to its appropriate removal off site or re-use where necessary. A suitably qualified environmental specialist should be contacted to advise what further work is required.

The on-site manager should be appointed by the contractor and it would be recommended that this person be able to display the relevant level of qualification and/or experience in managing major construction works on contaminated land.

6.5 Waste Disposal

If material is to be disposed of off site it is recommended that a copy of the laboratory results are given to the waste contractors and/or landfill operators involved discussing the requirements with regards to removal of surplus subsoils from the site and the acceptance of the waste at the landfill.

All materials must be transported in compliance with the Duty of Care Regulations by authorising movements with Carrier's individually numbered Duty of Care conveyance notes, complete with the appropriate EWC Codes. All relevant dockets will need to be kept to provide evidence of the removal.

It may be necessary depending upon the specific requirements of the waste carrier and accepting landfill facility to complete Waste Acceptance Criteria (WAC) testing on additional material screened from site; it is prudent to ascertain the testing requirements of each prior to the movement of any spoil.

The client or principal contractor has a responsibility to ensure that a Site Waste Management Plan (SWMP) is in place before demolition, excavation and/or construction works commence for projects exceeding costs of £300,000. The plan must record predicted and actual waste streams involved in the site works as well as distinguishing between inert, non-inert and hazardous waste by way of WAC testing. The plan must also identify how such wastes will be managed with reuse, recycling and/or recovery options being explored before disposal options are considered. For projects exceeding £500,000, the SWMP must be updated at least every six months to record actual volumes of waste produced with precise information about disposal arrangements and where that will occur.

6.6 Services

We would recommend that if new services are to be included into the design of this development, the local water board are contacted to determine the type of pipework that should be used on this site on the basis of the elevated levels of contamination proven. In the case of hydrocarbon contamination it is recommended double lined plastic or metallic pipes are used, as hydrocarbons can degrade plastic pipes.

It would be prudent to situate services within lined trenches. The trenches should be lined with a geotextile membrane and backfilled with clean fill, such as pea shingle, which will demarcate the services from the surrounding soils.