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Phase II Contaminated Land Assessment Report

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Executive Summary

Details	Comments
Introduction	This report has been prepared for Estate Office Shoreditch which is proposing to redevelop the site for mixed end use. The report presents an interpretation of the ground conditions and provides advice and guidance on contamination issues. It is intended to support the planning application for mixed use development at the site. MLMCL compiled a Desk Study for the site, the findings of which are presented in Preliminary Contamination Assessment Report, reference DMB/723931/R1 dated November 2012,
Current Site Setting	
Site Description	The site is currently vacant. It comprises mainly two storey building with a courtyard and is located at the rear of terrace houses abutting Gloucester Avenue.
Site History	The site was developed prior to 1875, probably for industrial usage. From 1953, building located in the eastern part of the site was part of the *Works* located off site to the east. From 1987, the building in the eastern part of the site was reconfigured for unknown usage. Recently the building was used by firms installing radios in cars.
Geology	The geological map of the area shows the site to be underlain by London Clay. No drift deposits are shown to be present.
Hydrogeology	The London Clay is classified as unproductive strata. The site is not within a groundwater SPZ.
Hydrology	No on-site water features were observed. The closest significant surface water feature is Regents Canal approximately 0.4km to the south east.
Ground Investigation	
Ground Conditions	Made ground was present across the site to depths of between 2.55m and 3.60m. The made ground is underlain by London Clay which was present to at least 5.0m below existing ground level (bgl) but not fully penetrated in any of the boreholes.
Groundwater	No groundwater was encountered during the investigation. Post-fieldwork monitoring encountered groundwater at depth of 2.82m bgl.
Contamination Observations	Made ground was encountered across the site; containing burnt coal pieces. There was no olfactory evidence of hydrocarbon contamination or other odours at the site.
Soil Contamination	Recorded levels of PAHs and lead in the made ground were above human health Generic Assessment Criteria levels for residential end use. PAH concentrations were also present above UKWIR TV's for plastic potable water supply pipes.
Gas/Vapour Levels	Elevated levels of ground gas were not recorded.
Remediation Requirements	Recommended remedial measures for development are as follows: • Excavate the made ground and validate the void *or* cap the gardens and soft landscaped areas with clean imported soil • Upgraded water supply pipes • Installation of services in corridors of clean soil

Executive Summary (cont'd)

Contamination Assessment	
Reccomendations	A remediation strategy document and verification documents will be required for the site. A refurbishment and demolition asbestos survey should be undertaken on all buildings prior to any refurbishment or demolition taking place. This is a legal requirement.

Limitations and Exceptions

1. This report and its findings should be considered in relation to the terms and conditions proposed and scope of works agreed between MLM Consulting Limited and the client.

2. The Executive Summary, Conclusions and Recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon until considered in the context of the whole report and the development, if any, proposed.

3. The assessment and interpretation of contamination and associated risks are based on the scope of work agreed with the client and the report may not be sufficient to fully address contaminations or to allow detailed remediation design to proceed without further investigation and analysis.

4. Any assessments made in this report are based on the ground conditions as revealed by the exploratory holes and pits, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant data which may have been obtained for the sites including previous site investigation reports. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.

5. Interpretations and recommendations contained in the report represent our professional opinions, which were arrived at in accordance with currently accepted industry practices at the time of reporting and based on current legislation in force at that time.

6. Where the data available from previous site investigation reports, supplied by the Client, have been used, it has been assumed that the information is correct. No responsibility can be accepted by MLM Consulting Limited for inaccuracies within the data supplied.

7. Whilst the report may express an opinion of possible configuration of strata between or beyond exploratory hole or pit locations, or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only and no liability can be accepted for the accuracy.

8. Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. It should be noted, however, that groundwater levels vary due to seasonal or other effects.

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11. This report was prepared only for our Client and was not intended to be relied on by any other party. Third parties should not rely on the facts, matters or opinions set out in this report without the express written permission of MLM Consulting Limited.

1 Introduction

1.1 General

This report has been prepared by MLM Consulting Limited (MLMCL) for Estate Office Shoreditch which is proposing to redevelop the site for mixed end use.

The report provides a generic quantitative risk assessment (GQRA) of contamination risks to health and safety and the environment, and provides a summary of recommended mitigation or remediation measures based on this GQRA.

No geotechnical investigation or assessment has been undertaken or commissioned.

It is understood that this report will be used to support the discharge of planning conditions associated with contamination land.

1.2 Proposed Development

The proposed development is for mixed use development with planting either in planters or beds as shown on PATALAB Architects drawing: Proposed Ground Floor Plan, Drawing No A8001, dated 31-1--12.

1.3 Terms of Reference

The terms of reference for the work were set out in the MLMCL proposal dated 3 April 2012, reference DMB/723931/001FP/DJG.and included the following scope of work:

- Construction of up to 5 No. small diameter windowless sample boreholes up to maximum depth of 5m.
- Collection of soil samples for chemical analysis.
- Logging of sample holes by a qualified Geo-environmental Engineer.
- Generic quantitative risk assessment of contamination and outline guidance on mitigation and remediation

1.4 Report Structure

This report is divided into a number of sections, which contain:

- Site description
- Summary of previous desk study findings
- Description of the intrusive investigations, monitoring and analyses undertaken
- Description of ground and groundwater
- Comparison of chemical test results to relevant generic guideline values
- Conceptual site model
- Generic quantitative risk assessment using source-pathway-receptor scenarios
- Summary of risks and proposed remedial action
- Summary and conclusions
- Factual data from the investigation

1.5 Technical Approach

The process of assessment adopted in this report generally follows the model procedures for the management of contaminated land described in the Environment Agency Contaminated Land Report 11 (CLR11).

The basic approach is:

- Hazard identification – establishing contaminant sources
- Hazard assessment – analysing the potential for unacceptable risks
- Risk estimation – predicting the magnitude and probability of the possible consequences
- Risk evaluation – deciding whether a risk is unacceptable.

This report forms a Tier 2 generic quantitative risk assessment (GQRA) as described in the CLR11 assessment process.

2 The Site

2.1 Location and Description

The site is located on the northern side of Gloucester Avenue, London. It is irregular in shape and covers an area of approximately 0.06 hectares. It is bounded to the north by railway lines and sidings, to the east by commercial buildings, to the south by residential dwellings with shops on the ground floor and Gloucester Avenue beyond it, and to the west by residential dwellings and Regents Park Road beyond it.

The site is currently vacant. It comprises mainly two storey building with a courtyard and is located at the rear of terrace houses abutting Gloucester Avenue. The access is via ground floor undercroft beneath the terrace residential dwellings.

The National Grid Reference for the approximate centre of the site is 528060E, 184210N.

A location plan of the site is presented as Figure 1.

2.2 Geology

The geological map of the area shows the site to be underlain by a solid geology of London Clay. No drift deposits are indicated to be present overlying the London Clay.

2.3 Hydrogeology

According to the Environment Agency (EA) website the London Clay is classified as unproductive strata.

Unproductive Strata are defined by the EA as rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

The site is not within a groundwater Source Protection Zone.

There are no abstractions for groundwater within 500m of the site

2.4 Hydrology

There are no water features on the site.

The closest significant surface water feature is Regents Canal approximately 0.4km to the south east.

There are no abstractions from surface waters within 500m of the site.

3 Previous Assessment

3.1 General

A Phase I Preliminary Contamination Assessment was carried out by MLMCL in October 2012, ref. DMB/723931/R1, and the findings are summarised below.

3.2 Summary of Findings

The site reconnaissance highlighted that the site is set in urban surroundings. The site is currently vacant and was last used by a company that installed radio equipment in vehicles.

Historical data shows the site was first prior to 1875, probably for industrial usage. From 1953, building located in the eastern part of the site formed part of the adjacent Works. From 1987, the building in the eastern part of the site was reconfigured for unknown usage.

A preliminary conceptual site model was compiled for the site. The risk assessment identifies on-site and off-site sources of contamination that present Very low to Moderate risks to receptors, indicating that there is a potential for contamination to have an unacceptable impact on the identified receptors (human health and services).

Areas of specific concern (moderate risk) are from on site contamination from made ground from the construction and demolition of the former buildings and contaminants associated with the former *Works* in the northern part of the site.

4 Geo-environmental Investigation

4.1 Scope of Intrusive Investigations

Fieldwork was carried out at the site on 5 September 2012 and comprised the following:

Table 4.1 Summary of Intrusive Investigation

Scope of Works	No.	Ref.	Depth Range (m bgl)
Windowless Sampling	5	WS1 – WS5	4-5

The locations of all exploratory holes were positioned by an MLMCL engineer according to the rationale below, taking into account any existing site features, underground services and areas of potential contamination. The locations of all the exploratory holes are shown on Figure 2. All exploratory holes were logged by a Geoenvironmental Engineer in accordance with BS 5930: 1990, incorporating Amendment No. 2.

The engineer's borehole logs are presented in Appendix A.

4.2 Contamination Rationale

The investigation was targeted according to the proposed site layout and desk study report findings. Areas of concern and associated contaminants are indicated in Table 4.2 below together with the corresponding exploratory hole position.

Table 4.2 Rationale for Contamination Sampling and Testing

Target/Area	Potential Contamination	Exploratory Hole Ref.
Eastern part of former *works*	Hydrocarbons, PAH and metals, ground gas	WS1, WS2, WS3
Northern part of former buildings	PAH and metals	WS4 and WS5

4.3 Sampling

Continuous soil cores were recovered from the windowless sampler boreholes in PVC liners to prevent cross contamination and aid sample recovery.

Contamination samples were recovered in tubs or glass jars, depending on the proposed laboratory analysis.

Sample types and depths are recorded on the relevant exploratory hole records.

4.4 Monitoring Wells

Gas/groundwater monitoring pipes were installed in made ground following completion of boring in boreholes WS1 and WS3 to depths of 4m bgl.

The monitoring well comprised 50mm plain casing with an annulus sealed using bentonite pellets. Below this, the casing in the response zone was slotted with the annulus filled with pea gravel.

Where gas monitoring is required, the installations were completed at the surface with a gas valve, beneath a flush mounted inspection cover. Details of the installation are provided on the relevant borehole log.

4.5 Fieldwork Monitoring

The presence of organic vapours was recorded with the use of a Phocheck 3000 Photo -ionisation detector (PID). The results are shown on the logs

4.6 Post-Fieldwork Monitoring

Following the completion of the fieldwork, three return visits to site were carried out between 28 September 2012 and 11 October 2012 during fall in atmospheric pressure to monitor for ground gases, organic vapours and groundwater level.

Carbon dioxide (CO_2), methane (CH_4), oxygen (O_2) and barometric pressure were recorded using a Gasdata GFM435 gas analyser. The depth to groundwater from the surface was measured with the use of a tape dipmeter.

The results of gas and groundwater monitoring undertaken are presented in Appendix B.

4.7 Contamination Testing Laboratory Analysis

The following analytical tests were scheduled on samples recovered from the exploratory holes according to the investigation rationale and field observations.

Table 4.3 Schedule of Chemical Testing

Test	Soil	Leachate
Metals: As, Cd, Cr, Pb, Hg, Ni, Se, Cu, Zn	7	1
Petroleum Hydrocarbons: TPHCWG aromatic/aliphatic split	4	1
Speciated PAH (USEPA 16)	7	
Qualitative Analysis of Asbestos	2	

Chemical analysis was undertaken by a UKAS-accredited laboratory and the results are presented in Appendix C.

5 Ground and Groundwater Conditions

5.1 General

The sequence of strata encountered during the investigation generally matches the anticipated geology as shown on the geological map. The ground conditions encountered across the site comprise the following general strata sequence.

Table 5.1 Generalised Strata Sequence

Strata	Depth range (m bgl)		Thickness range (m)
	Top	Base	
Made Ground	Ground Level	2.55 - 3.60	2.55 - 3.60
London Clay	2.55 - 3.60	>5.00	>0.80 - >1.45

➢ Base of stratum not proven
1 Encountered only in WS1

It should be noted that features, structures or certain ground conditions may be present between exploratory hole locations which are different to those encountered during the investigation.

5.2 Made Ground

All exploratory holes were surfaced by non reinforced and reinforced or block paving with made ground present immediately below to depths of between 2.55m and 3.60m bgl.

The made ground varied between brown clayey gravel and soft and firm brown sandy clay. The gravel content included brick, concrete, clinker and occasional wood pieces.

The base of the made ground was identified within all exploratory holes.

5.3 London Clay

The London Clay was encountered underlying the made ground in all the exploratory holes. The London Clay comprises stiff light brown sandy clay with rare limestone gravel. The full depth of the London Clay was not proven in any of the exploratory holes.

5.4 Groundwater

Groundwater was not encountered in any of the exploratory holes at the time of the investigation. Post-fieldwork monitoring of the wells encountered groundwater at depth of 2.82m bgl.

5.5 Contamination Observations

Made ground, which is often of an indicator for the potential presence of contamination, was encountered across the site and contained clinker and ash. There was no olfactory evidence of hydrocarbon contamination in any of the exploratory holes.

6 Discussion of Soil Test Results

6.1 Contaminant Trigger Levels and Reference Criteria

This section presents a generic quantitative risk assessment (GQRA) of potential soil contamination. GQRA involves a comparison of chemical laboratory results to generic assessment criteria (GAC) that are considered appropriate and relevant to the context of the site. The purpose of the GQRA is to identify potential sources of contamination for further evaluation in the Contaminated Land Risk Assessment section of the report. GAC used in human health risk assessments have been adopted from the following guidance:

- Soil guideline values (SGV) derived using the Contaminated Land Exposure Assessment (CLEA) model and published on the Environment Agency website. Currently these GAC are for arsenic, cadmium, mercury, nickel, selenium, BTEX compounds and phenols. The new SGVs do not differentiate between 'with' and 'without' plant uptake. For the purpose of the GQRA the term SGV is taken to mean GAC.
- GAC published jointly by LQM and the Chartered Institute of Environmental Health. Currently these are for TPH aromatic/aliphatic, polyaromatic hydrocarbons, chlorophenols, chlorinated solvents and certain metals. GAC for TPH and PAH compounds are soil organic matter dependent (where SOM was not determined a value of 1% is assumed)
- GAC published jointly by the Environmental Industries Commission, Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Applications in Real Environments for a range of volatile organic compounds and certain metals (EIC/AGS/CL:AIRE 2009)

A full list of GAC used in the assessment is included in Appendix D.

Risks to water supply pipes have been assessed using guidance published by UKWIR. The guidance provides threshold concentrations above which organic compounds can permeate water supply pipes, impact on their construction and cause a water quality issue for consumers. Previous guidance from WRAS has been withdrawn but may still be in use by certain water supply companies. For the purposes of this assessment it is assumed that polyethylene water supply pipework will be adopted. Should an alternative material (such as PVC) be adopted different TVs may apply.

Potential risks to plant life, such as for proposed landscaping, are assessed through BS3882:2007. This standard sets out the threshold values in soil above which phytotoxic effects can occur from the metals copper, nickel and zinc.

Appropriately sensitive testing methods have been adopted throughout and on this basis, where contaminants are recorded at less than detection limits, they are considered to be 'not present'.

6.2 Risks to Human Health

The proposed development is defined as a residential end use for the purpose of human health risk assessment.

Soil organic matter (SOM) tests were not undertaken and therefore a SOM content of 1.0% has been used when assessing risks from organic compounds.

Table 6.1 below provides a summary of the contaminant concentrations recorded above their respective GAC. Results below GAC are not presented in the table and further assessment of these contaminants is considered unnecessary.

Table 6.1 Soil Test Results Exceeding Human Health GAC

Contaminant	GAC	Min	Max	Location Exceeding (location, depth, conc.)
Lead	450	35	570	WS1, 0.8m, 510 WS2, 0.8m, 570
Benzo[a]anthracene	3.1	<0.1	4.7	WS3, 0.9m, 4.7
Benzo[a]pyrene	0.83	<0.1	3.9	WS3, 0.9m, 3.9.

All concentrations in mg kg^{-1}

No potentially asbestos containing materials were observed during the investigation and the samples tested did not contain asbestos fibres.

6.3 Risks to Water Supply

Samples of made ground (through which any new sewerage and water supply pipes are likely to pass) were analysed for the organic substances listed by UKWIR guidance.

Concentrations of PAH compounds (2.9mg/kg to 64mg/kg) are recorded above the threshold values (TVs) for PAHs (2mg/kg) listed in the guidance and there is the potential for these organic compounds to permeate polymer-based pipe work and impact on the quality of potable water or cause degradation of the pipe construction.

It should be noted that the TVs are for use by designers in the selection of appropriate pipe materials. Exceedance of a TV indicates only that there could be a 'water quality issue'. TVs are generally protective of taste and odour quality of water in plastic water pipes and only TVs for benzene and MTBE are protective of human health.

6.4 Risks to Plant Life

Recorded concentrations of potentially phototoxic contaminants are below GAC in all samples tested.

6.5 Nature and Distribution of Soil Contamination

Made ground at shallow depth in the east of the site contained concentrations of PAHs and lead above human health GAC in WS1, WS2 and WS3.

Water supply TVs for PAH was exceeded in made ground in WS1, WS2 and WS3.

Made ground across the site is free from metal compounds above phytotoxicity TVs.

Natural soils are free from elevated concentrations of metal and organic compounds above human health GAC, water supply pipe TVs and phytotoxicity TVs.

7 Assessment of Groundwater and Soil Leachate Chemical Data

7.1 Approach

Potential risks to controlled waters have been assessed generically based on the results of soil leachate testing.

In assessing the levels of compounds in groundwater beneath the site, the results of analyses have been compared to Environmental Quality Standards (EQS) for List 1 and List 2 dangerous substances (EC 1976). There are no EQS for PAH and reference is made to an EQS of 10µg l^{-1} for naphthalene.

7.2 Soil Leachate

Laboratory analysis of made ground soil leachate did not record metal or organic compounds above their respective EQS.

7.3 Nature and Distribution of Leachate Contamination

Based on soil leaching tests metal or organic compounds in made ground are unlikely to leach out and generate pore water concentrations in excess of EQS.

8 Assessment of Ground Gas and Organic Vapour Data

This section presents a GQRA to identify potential sources of gas and organic vapour in the ground that could impact on human health.

8.1 Guidelines

This section presents a GQRA of potential impacts on human health from gas and organic vapour in the ground.

The potential impact of ground gas on development is assessed through the British Standard BS8485 and reference to the Characteristic Situation designations published by CIRIA is adopted.

A generic quantitative risk assessment for organic vapour (v-GQRA) has been undertaken in accordance with the CIRIA VOC Handbook C682 to assess the potential impact on human health from the indoor inhalation of vapour generated by organic compounds in soil. For TPH, the LQM GAC is considered to be protective of human health from the indoor inhalation of organic vapour.

8.2 Sources of Ground Gas

The made ground is a potential source of ground gas. There was no visual or olfactory evidence of hydrocarbon contamination recorded during the investigation.

8.3 Screening Assessment – Ground Gas

A total of 3 return visits for each phase of the investigation were made to site between 4 November 2011 and 9 February 2012 following the fieldwork and recorded the following site maxima.

Table 8.1 Site Maximum Gas Concentrations and Flow Rate

Parameter	Site maximum
Methane	<0.1%
Carbon dioxide	1.0%
Flow rate	<0.1 l hr^{-1}

Based on monitoring undertaken, a gas screening value has been calculated for carbon dioxide of 0.001 l hr^{-1}. Methane was absent from the site.

The screening assessment for gas places the site in a CIRIA Characteristic Situation 1 for carbon dioxide.

8.4 Screening Assessment – Organic Vapour

Based on soil test results for TPH compounds, v-GAC for compounds in soil are not exceeded at the site. Low concentrations of VOCs were recorded during post-fieldwork monitoring and therefore it is considered that organic vapour is not a significant concern. Based on testing and monitoring to date, there is no risk to human health from the indoor inhalation of vapour generated by TPH compounds in soil.

8.5 Nature and Distribution of Gas and Organic Vapour Contamination

Low concentrations of carbon dioxide up to 1.0% were recorded during monitoring. Concentrations of methane and gas flows were not recorded above the minimum detection limits of the monitoring equipment. On the basis of these results it is considered that ground gas does not present a significant risk at the site.

9 Contaminated Land Risk Assessment and Conceptual Site Model

9.1 General Approach

In the UK, the assessment of risk from contamination follows the source-pathway-receptor approach. If one of these three elements is absent it is considered that there is no risk of harm. If, however, there is considered to be a linkage between source and receptor then a risk-based approach is used to assess the significance or impact of the potential SPR-linkage.

Source – Contamination that has the potential to impact on human health and/or the environment. Identification of sources of contamination will normally involve generic quantitative risk assessment (GQRA), which compares test results with current guidelines. GQRA was undertaken in the preceding sections of the report.

Pathway – The route by which a receptor may come into contact with the source.

Receptor – Receptors are typically humans or the environment (e.g. water resources) that could be affected by contamination.

Risks are defined as the likelihood of an event occurring combined with the magnitude of the consequence of that event occurring. This is explained further and definitions provided in Appendix E.

9.2 Review of Potential Sources of Contamination

Based on the GQRA presented in the previous sections, potential sources of contamination that could impact on receptors within the areas of development have been identified and are summarized in Table 9.1 below.

Table 9.1 Potential Sources of Contamination

Receptor Type	Source
Human Health – future site users	PAH and lead compounds in made ground
Construction workers and services maintenance staff	PAH and lead compounds in made ground
Water supply pipes	PAH compounds in made ground

9.3 Review of Potential Exposure Pathways

Table 9.2 below presents a review of possible pathways that could exist at the site.

Table 9.2: Potential Exposure Pathways and Receptors

Receptor	Pathway	Present	Notes
Human Health			
Future site users	Dermal contact, ingestion or inhalation of soil and soil dust	YES	PAH and lead compounds in excess of GAC are present in made ground and site users could come into contact with contaminated soils in garden areas.
	Migration in permeable strata and inhalation of gas/organic vapours	NO	No significant gas concentrations or gas flows have been recorded on site.
	Migration in permeable strata, accumulation and risk of explosion	NO	No significant gas concentrations or gas flows have been recorded on site.
Adjacent site users	Ingestion/inhalation of windblown dust	YES	Windblown dust containing PAH and lead compounds in excess of GAC could be generated during the construction period.
Construction workers and services maintenance staff	Dermal contact, ingestion or inhalation of soil and soil dust	YES	Construction and services maintenance workers could be exposed to soil contamination when working in excavations etc
Development			
Future plant life	Plant uptake in garden or landscape area	NO	Phytotoxins below GAC values.
Water supply pipes	Contact with contaminated material	YES	PAH compounds in excess of GAC noted in made ground and could permeate potable water supply pipes and affect drinking water quality.
Environment			
Surface water - Drainage ditch	Surface runoff	NO	Existing and future drainage systems will intercept any runoff before it can impact upon surface water. Low permeability soils beneath the site will limit migration of contaminants.
	Groundwater movement	NO	
Groundwater	Leaching from soil	NO	Low permeability soils beneath the site will limit migration of contaminants.
	Groundwater movement	NO	Low permeability soils beneath the site will limit migration of contaminants.
	Deep foundations breaching impermeable layer	NO	Deep foundations which could penetrate the London Clay are not proposed

9.4 Potentially Complete SPR-Linkages

Based on the sources, pathways and receptors identified above, table 9.3 below summarises all complete pollutant linkages for the site and identifies the level of risk from each with regards to the proposed end use of the site.

Table 9.3: Potentially Complete SPR-Linkages and Risk Assessment for Proposed Residential Area

Possible Origin	Area Affected	Contaminants	Pathway	Receptor	Likelihood	Potential Magnitude	Overall Risk	Notes
Made Ground	All of the site	Lead and PAH compounds	Direct contact	Site users	Possible	Moderate	Moderate	Site users could come in to contact with contaminated soils in gardens/landscaping.
			Direct contact	Site construction workers/post-construction maintenance workers	Possible	Mild	Low	Lead and PAH are toxic by accumulation in the body. The short exposure time of site construction and post construction maintenance workers suggests they are at low risk.
			Direct Contact	Adjacent site users	Unlikely	Moderate	Low	Hard landscaped proposed for most of the area will prevent generation of wind blown dust during occupation, however during construction, there may be some dust generated from exposed soils.
		PAH compounds	Direct contact with pipes	Water supply pipes	Possible	Moderate	Moderate	Permeation of pipework by PAH could occur.

Direct contact is defined as exposure via the routes of ingestion, dermal contact and inhalation of soil and dust.

10 Remediation and Risk Management

10.1 General

This assessment has identified potential hazards at the site with possible SPR-linkages which could represent potentially unacceptable risks to human health. These risks are specifically associated with made ground containing PAHs and lead, which present a risk to human health and water supply pipes by direct contact.

Mitigation of the SPR-linkages summarised in Table 10.1 is recommended to reduce the impact of contamination on site occupants and environmental receptors.

The following is for guidance only and does not represent the final design of a remediation scheme. Remediation schemes normally require local authority and/or Environment Agency approval of a remediation strategy and verification plan. All remediation work should be designed, overseen and validated by environmental consultants.

10.2 Soil Remediation

Limited and localised remedial action on soil contamination is advised, based on current findings as follows:

Table 10.1 Summary of Recommended Remediation or Mitigation

Aspect	Description
Gardens and soft landscaping	Excavate the made ground to depth of 0.6m below final ground level, validate the surface of the excavation and replace with clean topsoil. Alternatively cap with clean cover soils. Recommended minimum thickness is 600mm in domestic gardens and 450mm in amenity or landscape areas. The thickness of topsoil, if required, is normally in addition to the thickness of capping. If capping raises the ground profile the approval of the local Planning Officer may be required.
Water supply pipes	Protected or upgraded water supply pipes in line with local water supply company requirements.
Services generally	Bedding, backfill and surround to all services to be clean imported materials such that installation of new pipework and future maintenance is in clean soil.

The choice of excavation or capping depends primarily on anticipated development levels. Wherever excavations to facilitate construction take place, it is possible that soil contamination will be removed anyway and where site levels are raised, capping will be introduced.

Remediation is generally not required beneath capping of buildings or hard standing as these break the pathway between source and receptor.

10.3 Groundwater Remediation

Based on testing to date, groundwater remediation is not considered to be required at the site.

10.4 Gas and Organic Vapour Protection

Based on monitoring to date, gas and organic vapour protection is not required in new buildings on site.

10.5 Construction Health and Safety

The following is provided for guidance only.

It is recommended that construction workers at the site adopt appropriate personal hygiene precautions at the site, particularly hand washing, wearing of gloves, avoidance of hand to mouth contact and use of designated 'clean' and 'dirty' areas.

Handling of soil and water should be minimised, and dust suppression measures should be implemented, particularly during any excavation through the made ground. Soils should be dampened during excavation to limit dust and handling and lorries suitably sheeted.

Gas and vapour monitoring should be carried out before man entry into deep excavations or confined spaces.

These precautions are considered to be industry standard when developing contaminated land and reference can be made to the HSE document HSG66 *Protection of workers and the general public during development of contaminated land* (HSE 1991) for further information.

10.6 Material Re-Use

Soils on site are considered suitable for re-use on site provided they do not pose a risk to human health or the environment. Where made ground soils are reused they will need to be capped unless placed below buildings or roads/paving.

10.7 Remediation Documentation

Based on the findings and recommendations of this report, a remediation strategy and verification plan for the site will be required for submission to the local authority.

This document considers how the remediation options are to be implemented such that remediation objectives are met and describes how evidence of remediation is to be obtained through verification.

11 Conclusions and Recommendations

11.1 Conclusions

The investigation has proved made ground up to 3.60m thick overlying London Clay.

PAH and lead compounds have been recorded in made ground at concentrations which could impact on site workers, site maintenance staff, and future site occupants. Limited soil remediation will be required.

There is no risk from metal or organic compounds leaching from made ground soil and impacting upon controlled water receptors.

Gas protection measures will not be required in new buildings at the site based on monitoring undertaken at the site.

11.2 Recommendations

Recommended remedial measures include:

- Excavation and removal of contaminated soil or capping, in gardens and soft landscaped areas
- Services installed in corridors of clean soil
- Upgraded water supply pipes

A remediation strategy and verification plan for the site will be required for submission to the local authority.

A refurbishment and demolition asbestos survey should be undertaken on all buildings prior to any refurbishment or demolition taking place. This is a legal requirement.

12 References

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Figures

Figure 1: Site Location Plan
Figure 2: Exploratory Hole Location Plan

MLM www.mlm.uk.com	Figure	1
	Project	134a & 136 Gloucester Avenue, Camden
	Project Ref	723931
	Date	November 2012

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.

2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

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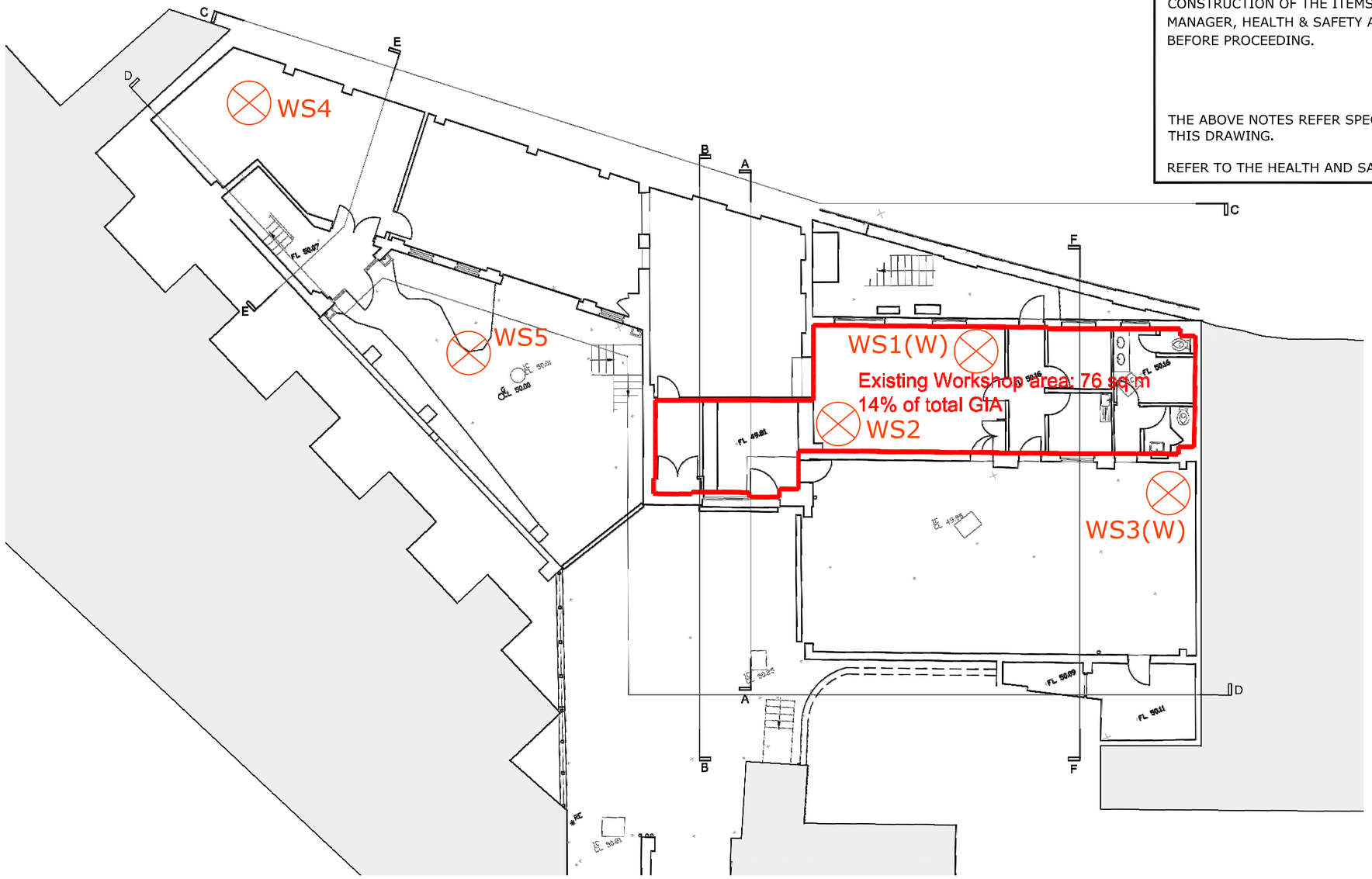
THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.



Rev	Date	Description	Made	Ckd
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Website: www.mlm.uk.com

Drawing Status: INFORMATION

Client: ESTATE OFFICE, SHOREDITCH

Project: 134 - 136 GLOUCESTER AVENUE

Drg Title: INDICATIVE EXPLORATORY HOLE PLAN

Drawn/Design	Checked	Approved	Date
IE / SG	SG	SG	29.10.2012

Scales: n.t.s. @ A3

Drg No.: 723931 / FIG 2

Rev: .

Appendices

Appendix A: Window Sample Logs
Appendix B: Groundwater and Ground Gas Monitoring
Appendix C: Results of Contamination Testing
Appendix D: Generic Assessment Criteria
Appendix E: Defining Risk

Appendix A

Window Sample Logs

Project: 134-136 Gloucester Avenue
Location: Camden, London

Project ID: 723931
Client: The Estate Office Shoreditch
Project Engineer: S. Chara/P. Mistry
Logged by: G. Evans

BOREHOLE REF: WS1

Drilling Method: Window Sampler
Start of Drilling: 05/09/2012
Completion: 05/09/2012
Ground Level (mAOD): -
Coordinates: -

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IN SITU TESTS/SAMPLING				STRATA						
Sample Ref.	SPT Results (Type)	PID Reading (ppm)	Shear Strength (kPa)	Level (mAOD)	Depth (m)	Legend	Description of Strata	Thickness (m)	Installation Details	Water (m)
ES: 0.30-0.50m		0			0.20		Reinforced CONCRETE. 6mm rebar at 0.15m (CONCRETE)	0.20		Dry
ES: 0.80-1.00m		0					Brown clayey fine to coarse GRAVEL of brick, flint, sandstone, concrete and clinker. (MADE GROUND)	0.90		
ES: 1.30-1.50m		0			1.10		Soft and firm brown sandy CLAY FILL with occasional brick, concrete and rare clinker gravel. (MADE GROUND)	1.80		
		0			2.90		MADE GROUND: Soft grey and brown sandy CLAY with much brick, concrete and occasional wood fragments. (MADE GROUND)	0.30		
		0			3.20		Stiff light brown sandy CLAY with rare limestone gravel.	0.80		
					4.00		*End of Borehole at 4.00 m*			

Notes:
1. When undertaken shear strengths recorded using Hand Shear Vane.
2. When undertaken PID readings recorded using Photoionisation Detector

Remarks:
1. Well installed to 4.0m bgl.2. Groundwater not encountered.

Legend:

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT "N" Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
ES	Environmental Sample (1 tub & 1 jar)
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Well Installation/Backfill Legend:

Backfill Details:
- Concrete
- Bentonite
- Filter Gravel
- Arisings Backfill

Pipe Details:
- Plain Pipe
- Slotted Pipe
- Piezometer Tip

Project: 134-136 Gloucester Avenue
Location: Camden, London

Project ID: 723931
Client: The Estate Office Shoreditch
Project Engineer: S. Chara/P. Mistry
Logged by: G. Evans

BOREHOLE REF: WS2

Drilling Method: Window Sampler
Start of Drilling: 05/09/2012
Completion: 05/09/2012
Ground Level: (mAOD) -
Coordinates: -

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IN SITU TESTS/SAMPLING				STRATA						
Sample Ref.	SPT Results (Type)	PID Reading (ppm)	Shear Strength (kPa)	Level (mAOD)	Depth (m)	Legend	Description of Strata	Thickness (m)	Installation Details	Water (m)
ES: 0.30-0.50m		0			0.21		Concrete hard standing. (CONCRETE)	0.21		Dry
ES: 0.80-1.00m		0			1.10		Brown clayey fine to coarse GRAVEL of brick, flint, sandstone, concrete and clinker. (MADE GROUND)	0.89		
ES: 1.30-1.50m		0			2.50		Soft and firm brown sandy CLAY FILL with occasional brick, concrete and rare clinker gravel. (MADE GROUND)	1.40		
		0			3.00		Soft grey and brown sandy CLAY with much brick, concrete and occasional wood fragments. (MADE GROUND)	0.50		
		0			4.00		Stiff light brown sandy CLAY with rare limestone gravel.	1.00		
							End of Borehole at 4.00 m			

Notes:
1. When undertaken shear strengths recorded using Hand Shear Vane.
2. When undertaken PID readings recorded using Photoionisation Detector

Remarks:
1. Borehole backfilled with arisings.2. Groundwater not encountered.

Legend:

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT "N" Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
ES	Environmental Sample (1 tub & 1 jar)
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Well Installation/Backfill Legend:

Backfill Details:
- Concrete
- Bentonite
- Filter Gravel
- Arisings Backfill

Pipe Details:
- Plain Pipe
- Slotted Pipe
- Piezometer Tip

Project: 134-136 Gloucester Avenue
Location: Camden, London

Project ID: 723931
Client: The Estate Office Shoreditch
Project Engineer: S. Chara/P. Mistry
Logged by: G. Evans

BOREHOLE REF: WS3

Drilling Method: Window Sampler
Start of Drilling: 05/09/2012
Completion: 05/09/2012
Ground Level (mAOD): -
Coordinates: -

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IN SITU TESTS/SAMPLING				STRATA						
Sample Ref.	SPT Results (Type)	PID Reading (ppm)	Shear Strength (kPa)	Level (mAOD)	Depth (m)	Legend	Description of Strata	Thickness (m)	Installation Details	Water (m)
ES: 0.30-0.50m		0			0.14		Concrete hard standing. (CONCRETE)	0.14		Dry
					0.23			0.09		
					0.30		Concrete hard standing. (CONCRETE)	0.07		
							Brick. (MADE GROUND)	0.60		
ES: 0.90-1.00m		0			0.90		Brown very clayey fine to coarse GRAVEL of brick, flint, sandstone, concrete and clinker. (MADE GROUND)			
ES: 1.30-1.50m		0					Soft and firm brown sandy CLAY FILL with occasional brick, concrete and rare clinker gravel. (MADE GROUND)	1.80		
		0								
		0			2.70		Soft grey and brown sandy CLAY with much brick, concrete and occasional wood fragments. (MADE GROUND)	0.40		
					3.10		Stiff light brown sandy CLAY with rare limestone gravel.	0.90		
					4.00		*End of Borehole at 4.00 m*			

Notes:
1. When undertaken shear strengths recorded using Hand Shear Vane.
2. When undertaken PID readings recorded using Photoionisation Detector

Remarks:
1. Well installed to 4.0m bgl.2. Groundwater not encountered.

Legend:

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT "N" Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
ES	Environmental Sample (1 tub & 1 jar)
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Well Installation/Backfill Legend:

Backfill Details: Concrete, Bentonite, Filter Gravel, Arisings Backfill

Pipe Details: Plain Pipe, Slotted Pipe, Piezometer Tip

Project: 134-136 Gloucester Avenue
Location: Camden, London

Project ID: 723931
Client: The Estate Office Shoreditch
Project Engineer: S. Chara/P. Mistry
Logged by: G. Evans

BOREHOLE REF: WS4

Drilling Method: Window Sampler
Start of Drilling: 05/09/2012
Completion: 05/09/2012
Ground Level (mAOD): -
Coordinates: -

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IN SITU TESTS/SAMPLING				STRATA						
Sample Ref.	SPT Results (Type)	PID Reading (ppm)	Shear Strength (kPa)	Level (mAOD)	Depth (m)	Legend	Description of Strata	Thickness (m)	Installation Details	Water (m)
ES: 0.30-0.80m		0			0.11		Reinforced CONCRETE. 6mm rebar at 0.06m (CONCRETE)	0.11		
					0.21		Polystyrene. (MADE GROUND)	0.10		
					0.5			0.64		
ES: 0.90-1.00m		0			0.85		Brown clayey fine to coarse GRAVEL of brick, flint, sandstone, concrete and clinker. (MADE GROUND)			
					1.0					
ES: 1.30-1.50m		0					Soft and firm brown sandy CLAY FILL with occasional brick, concrete and rare clinker gravel. (MADE GROUND)			
					1.5			1.15		
		0			2.00		Soft grey and brown sandy CLAY with much brick, concrete and occasional wood fragments. (MADE GROUND)			
		0			2.5			0.55		2.40
					2.55		Stiff light brown sandy CLAY with rare limestone gravel.			
					3.0					
					3.5			1.45		3.70
					4.00		*End of Borehole at 4.00 m*			
					4.5					
					5.0					
					5.5					
					6.0					
					6.5					
					7.0					
					7.5					

Notes:
1. When undertaken shear strengths recorded using Hand Shear Vane.
2. When undertaken PID readings recorded using Photoionisation Detector

Remarks:
1. Borehole backfilled with arisings.

Legend:

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT "N" Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
ES	Environmental Sample (1 tub & 1 jar)
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Well Installation/Backfill Legend:

Backfill Details: Concrete, Bentonite, Filter Gravel, Arisings Backfill

Pipe Details: Plain Pipe, Slotted Pipe, Piezometer Tip

Project: 134-136 Gloucester Avenue
Location: Camden, London

Project ID: 723931
Client: The Estate Office Shoreditch
Project Engineer: S. Chara/P. Mistry
Logged by: G. Evans

BOREHOLE REF: WS5

Drilling Method: Window Sampler
Start of Drilling: 05/09/2012
Completion: 05/09/2012
Ground Level (mAOD): -
Coordinates: -

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IN SITU TESTS/SAMPLING				STRATA						
Sample Ref.	SPT Results (Type)	PID Reading (ppm)	Shear Strength (kPa)	Level (mAOD)	Depth (m)	Legend	Description of Strata	Thickness (m)	Installation Details	Water (m)
ES: 0.30-0.50m		0			0.06		Block Paving. (MADE GROUND)	0.06		
					0.20			0.14		
					0.30		Brown fine to coarse SAND. (MADE GROUND)	0.10		
ES: 0.80-1.00m		0			0.70		Grey sandy concrete GRAVEL. (MADE GROUND)	0.40		
ES: 1.30-1.50m		0			1.0		Brown very clayey fine to coarse GRAVEL of brick, flint, sandstone, concrete and clinker. (MADE GROUND)	0.90		1.24
		0			1.60		Soft and firm brown sandy CLAY FILL with occasional brick, concrete and rare clinker gravel. (MADE GROUND)			
		0			2.0		Soft grey and brown sandy CLAY with much brick, concrete and occasional wood pieces. (MADE GROUND)			2.10
		0			2.5			2.00		
		0			3.0					
					3.60		Stiff light brown sandy CLAY with rare limestone gravel.	1.40		
					5.00		*End of Borehole at 5.00 m*			

Notes:
1. When undertaken shear strengths recorded using Hand Shear Vane.
2. When undertaken PID readings recorded using Photoionisation Detector

Remarks:
1. Borehole backfilled with arisings.

Legend:

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT "N" Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
ES	Environmental Sample (1 tub & 1 jar)
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Well Installation/Backfill Legend:

Backfill Details: Concrete, Bentonite, Filter Gravel, Arisings Backfill

Pipe Details: Plain Pipe, Slotted Pipe, Piezometer Tip

Appendix B

Groundwater and Ground Gas Monitoring

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Soil-Gas & Groundwater Monitoring / Sampling Site Data

Date	28/09/12	**Project**	Gloucester Avenue			**Calibrated / Checked**		**Logged in QA File**
Time	10:30	**Project Number**	723931	**Equipment Used**	GFM 435 Dip Meter P.I.D.	**Before**	**After**	
Technician	S. Hashemi	**Weather**	Rainy			Yes	Yes	

Notes:

Well No. / Location	CH_4 (%)	CO_2 (%)	O_2 (%)	Pressure (mbar)	Flow (l/hr)	Average VOC (ppm)	Peak VOC (ppm)	Instrument Accuracy Check	Height of Casing (m)	Depth to Water (mb casing)	Depth to Water (mbgl)	Sample Collected (Y/N)	Comments and Visual/Olfactory Description of Sample Collected
WS1	<0.1	0.2	20.3	1008	<0.1	<0.1	<0.1	YES	-	-	2.82	N	
WS3	<0.1	1.0	19.9	1008	<0.1	<0.1	<0.1	YES	-	-	3.08	N	

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Soil-Gas & Groundwater Monitoring / Sampling Site Data

Date	05/10/12	**Project**	Gloucester Avenue			**Calibrated / Checked**		**Logged in QA File**
Time	11:00	**Project Number**	723931	**Equipment Used**	GFM 435 Dip Meter P.I.D.	**Before**	**After**	
Technician	S. Hashemi	**Weather**	overcast			Yes	Yes	

Notes:

Well No. / Location	CH_4 (%)	CO_2 (%)	O_2 (%)	Pressure (mbar)	Flow (l/hr)	Average VOC (ppm)	Peak VOC (ppm)	Instrument Accuracy Check	Height of Casing (m)	Depth to Water (mb casing)	Depth to Water (mbgl)	Sample Collected (Y/N)	Comments and Visual/Olfactory Description of Sample Collected
WS1	<0.1	0.2	20.6	1002	<0.1	<0.1	<0.1	YES	-	-	Dry	N	
WS3	<0.1	0.6	20.5	1002	<0.1	<0.1	<0.1	YES	-	-	Dry	N	

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Soil-Gas & Groundwater Monitoring / Sampling Site Data

Date	11/10/12	**Project**	Gloucester Avenue			**Calibrated / Checked**		**Logged in QA File**
Time	14:30	**Project Number**	723931	**Equipment Used**	GFM 435 Dip Meter P.I.D.	**Before**	**After**	
Technician	S. Hashemi	**Weather**	Rainy			Yes	Yes	

Notes:

Well No. / Location	CH_4 (%)	CO_2 (%)	O_2 (%)	Pressure (mbar)	Flow (l/hr)	Average VOC (ppm)	Peak VOC (ppm)	Instrument Accuracy Check	Height of Casing (m)	Depth to Water (mb casing)	Depth to Water (mbgl)	Sample Collected (Y/N)	Comments and Visual/Olfactory Description of Sample Collected
WS1	<0.1	0.2	20.5	997	<0.1	<0.1	<0.1	YES	-	-	2.45	N	
WS3	<0.1	0.5	20.5	997	<0.1	<0.1	<0.1	YES	-	-	2.62	N	

Appendix C

Results of Contamination Testing

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Building 7200
IQ Cambridge
Cambridge
CB25 9TL

FAO S Chara / P Mistry

LABORATORY TEST REPORT

Results of analysis of 1 sample
received 10 September 2012

723931 - 134-136 Gloucester Avenue, Camden

Chemtest
The right chemistry to deliver results

Report Date
18 September 2012

Login Batch No					**212556**
Chemtest LIMS ID					AH71996
Sample ID					WS3
Sample No					
Sampling Date					Not Provided
Depth					1.30m
Matrix					*LEACHATE*
SOP↓	Determinand↓	CAS No↓	Units↓	*	
1450	Arsenic	7440382	µg l-1	U	1.5
	Boron	7440428	µg l-1	U	86
	Cadmium	7440439	µg l-1	U	<0.080
	Chromium	7440473	µg l-1	U	1.3
	Copper	7440508	µg l-1	U	1.2
	Mercury	7439976	µg l-1	U	<0.50
	Nickel	7440020	µg l-1	U	<1.0
	Lead	7439921	µg l-1	U	<1.0
	Selenium	7782492	µg l-1	U	1.8
	Zinc	7440666	µg l-1	U	2.1
1700	Naphthalene	91203	µg l-1	U	<0.1
	Acenaphthylene	208968	µg l-1	U	<0.1
	Acenaphthene	83329	µg l-1	U	<0.1
	Fluorene	86737	µg l-1	U	<0.1
	Phenanthrene	85018	µg l-1	U	<0.1
	Anthracene	120127	µg l-1	U	<0.1
	Fluoranthene	206440	µg l-1	U	<0.1
	Pyrene	129000	µg l-1	U	<0.1
	Benzo[a]anthracene	56553	µg l-1	U	<0.1
	Chrysene	218019	µg l-1	U	<0.1
	Benzo[b]fluoranthene	205992	µg l-1	U	<0.1
	Benzo[k]fluoranthene	207089	µg l-1	U	<0.1
	Benzo[a]pyrene	50328	µg l-1	U	<0.1

All tests undertaken between 10/09/2012 and 17/09/2012

* Accreditation status

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FAO S Chara / P Mistry

LABORATORY TEST REPORT

Results of analysis of 1 sample
received 10 September 2012

723931 - 134-136 Gloucester Avenue, Camden

Chemtest
The right chemistry to deliver results

Report Date
18 September 2012

					212556
					AH71996
					WS3
					Not Provided
					1.30m
					LEACHATE
1700	Dibenzo[a,h]anthracene	53703	µg l-¹	U	<0.1
	Indeno[1,2,3-cd]pyrene	193395	µg l-¹	U	<0.1
	Benzo[g,h,i]perylene	191242	µg l-¹	U	<0.1
	Total (of 16) PAHs		µg l-¹	U	<2

All tests undertaken between 10/09/2012 and 17/09/2012

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LABORATORY TEST REPORT

Results of analysis of 11 samples
received 10 September 2012

723931 - 134-136 Gloucester Avenue, Camden

Chemtest
The right chemistry to deliver results

Report Date
18 September 2012

Login Batch No					**212556**						
Chemtest LIMS ID					AH71985	AH71986	AH71987	AH71988	AH71989	AH71990
Sample ID					WS1	WS1	WS1	WS2	WS3	WS3
Sample No										
Sampling Date					Not Provided	Not Provided	Not Provided	Not Provided	Not Provided	Not Provided
Depth					0.80m	1.30m	2.50m	0.80m	0.90m	1.30m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M		8.2				8.1
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M		0.44				0.20
2450	Arsenic	7440382	mg kg-¹	M	10		8.4	10	7.3	
	Cadmium	7440439	mg kg-¹	M	<0.10		<0.10	<0.10	<0.10	
	Chromium	7440473	mg kg-¹	M	20		34	17	18	
	Copper	7440508	mg kg-¹	M	46		23	48	61	
	Mercury	7439976	mg kg-¹	M	1.9		0.14	0.88	1.00	
	Nickel	7440020	mg kg-¹	M	19		33	19	21	
	Lead	7439921	mg kg-¹	M	510		35	570	300	
	Selenium	7782492	mg kg-¹	M	<0.20		<0.20	<0.20	<0.20	
	Zinc	7440666	mg kg-¹	M	72		100	57	81	
2675	TPH aliphatic >C5-C6		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aliphatic >C6-C8		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aliphatic >C8-C10		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aliphatic >C10-C12		mg kg-¹	M	< 1 [1]			< 1 [1]	< 1 [1]	
	TPH aliphatic >C12-C16		mg kg-¹	M	< 1 [1]			< 1 [1]	< 1 [1]	
	TPH aliphatic >C16-C21		mg kg-¹	M	< 1 [1]			< 1 [1]	< 1 [1]	
	TPH aliphatic >C21-C35		mg kg-¹	M	< 1 [1]			< 1 [1]	< 1 [1]	
	TPH aliphatic >C35-C44		mg kg-¹	N	< 1 [1]			< 1 [1]	< 1 [1]	
	TPH aromatic >C5-C7		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aromatic >C7-C8		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aromatic >C8-C10		mg kg-¹	N	< 0.1 [1]			< 0.1 [1]	< 0.1 [1]	
	TPH aromatic >C10-C12		mg kg-¹	M	< 1 [1]			< 1 [1]	< 1 [1]	

[1]No sampling date was specified, stability times for this analyte may have been exceeded and these results may be compromised and will not be accredited (UKAS/MCerts)

All tests undertaken between 10/09/2012 and 17/09/2012

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LABORATORY TEST REPORT

Results of analysis of 11 samples
received 10 September 2012

Report Date
18 September 2012

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723931 - 134-136 Gloucester Avenue, Camden

Login Batch No					**212556**			
Chemtest LIMS ID					AH71991	AH71992	AH71993	AH71995
Sample ID					WS3	WS4	WS4	WS5
Sample No								
Sampling Date					Not Provided	Not Provided	Not Provided	Not Provided
Depth					2.50m	0.90m	2.50m	0.80m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
2010	pH			M			8.5	
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M			0.36	
2450	Arsenic	7440382	mg kg-¹	M	3.7	12		10
	Cadmium	7440439	mg kg-¹	M	<0.10	<0.10		<0.10
	Chromium	7440473	mg kg-¹	M	21	24		28
	Copper	7440508	mg kg-¹	M	120	27		27
	Mercury	7439976	mg kg-¹	M	0.88	0.16		0.16
	Nickel	7440020	mg kg-¹	M	14	26		30
	Lead	7439921	mg kg-¹	M	74	72		74
	Selenium	7782492	mg kg-¹	M	<0.20	<0.20		0.23
	Zinc	7440666	mg kg-¹	M	48	67		58
2675	TPH aliphatic >C5-C6		mg kg-¹	N		< 0.1 ¹		
	TPH aliphatic >C6-C8		mg kg-¹	N		< 0.1 ¹		
	TPH aliphatic >C8-C10		mg kg-¹	N		< 0.1 ¹		
	TPH aliphatic >C10-C12		mg kg-¹	M		< 1 ¹		
	TPH aliphatic >C12-C16		mg kg-¹	M		< 1 ¹		
	TPH aliphatic >C16-C21		mg kg-¹	M		< 1 ¹		
	TPH aliphatic >C21-C35		mg kg-¹	M		< 1 ¹		
	TPH aliphatic >C35-C44		mg kg-¹	N		< 1 ¹		
	TPH aromatic >C5-C7		mg kg-¹	N		< 0.1 ¹		
	TPH aromatic >C7-C8		mg kg-¹	N		< 0.1 ¹		
	TPH aromatic >C8-C10		mg kg-¹	N		< 0.1 ¹		
	TPH aromatic >C10-C12		mg kg-¹	M		< 1 ¹		

¹No sampling date was specified, stability times for this analyte may have been exceeded and these results may be compromised and will not be accredited (UKAS/MCerts)

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LABORATORY TEST REPORT

Results of analysis of 11 samples
received 10 September 2012

723931 - 134-136 Gloucester Avenue, Camden

Chemtest
The right chemistry to deliver results

Report Date
18 September 2012

					212556					
					AH71985	AH71986	AH71987	AH71988	AH71989	AH71990
					WS1	WS1	WS1	WS2	WS3	WS3
					Not Provided	Not Provided	Not Provided	Not Provided	Not Provided	Not Provided
					0.80m	1.30m	2.50m	0.80m	0.90m	1.30m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aromatic >C12-C16		mg kg-¹	M	< 1 [1]			< 1 [1]	1.2 [1]	
	TPH aromatic >C16-C21		mg kg-¹	M	< 1 [1]			< 1 [1]	5.7 [1]	
	TPH aromatic >C21-C35		mg kg-¹	M	< 1 [1]			< 1 [1]	6.8 [1]	
	TPH aromatic >C35-C44		mg kg-¹	N	< 1 [1]			< 1 [1]	< 1 [1]	
	Total Petroleum Hydrocarbons		mg kg-¹	N	< 10 [1]			< 10 [1]	14 [1]	
2700	Naphthalene	91203	mg kg-¹	M	0.38		< 0.1	< 0.1	0.79	
	Acenaphthylene	208968	mg kg-¹	M	< 0.1		< 0.1	< 0.1	0.18	
	Acenaphthene	83329	mg kg-¹	M	0.2		0.39	0.14	1.1	
	Fluorene	86737	mg kg-¹	M	0.23		0.26	< 0.1	1.3	
	Phenanthrene	85018	mg kg-¹	M	0.47		1.1	0.22	11	
	Anthracene	120127	mg kg-¹	M	0.19		0.23	0.1	2.6	
	Fluoranthene	206440	mg kg-¹	M	0.72		0.68	0.33	11	
	Pyrene	129000	mg kg-¹	M	0.58		0.42	0.26	8.4	
	Benzo[a]anthracene	56553	mg kg-¹	M	0.36		< 0.1	0.21	4.7	
	Chrysene	218019	mg kg-¹	M	0.44		< 0.1	0.25	5.9	
	Benzo[b]fluoranthene	205992	mg kg-¹	M	0.54		< 0.1	0.43	4.8	
	Benzo[k]fluoranthene	207089	mg kg-¹	M	0.4		< 0.1	0.31	2.8	
	Benzo[a]pyrene	50328	mg kg-¹	M	0.38		< 0.1	0.3	3.9	
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1		< 0.1	< 0.1	0.86	
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	< 0.1		< 0.1	0.2	2.8	
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	< 0.1		< 0.1	0.13	2.1	
	Total (of 16) PAHs		mg kg-¹	M	4.9		3.1	2.9	64	

[1]No sampling date was specified, stability times for this analyte may have been exceeded and these results may be compromised and will not be accredited (UKAS/MCerts)

All tests undertaken between 10/09/2012 and 17/09/2012

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LABORATORY TEST REPORT

Results of analysis of 11 samples
received 10 September 2012

Report Date
18 September 2012

FAO S Chara / P Mistry

723931 - 134-136 Gloucester Avenue, Camden

					212556			
					AH71991	AH71992	AH71993	AH71995
					WS3	WS4	WS4	WS5
					Not Provided	Not Provided	Not Provided	Not Provided
					2.50m	0.90m	2.50m	0.80m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2675	TPH aromatic >C12-C16		mg kg-¹	M		< 1 [1]		
	TPH aromatic >C16-C21		mg kg-¹	M		< 1 [1]		
	TPH aromatic >C21-C35		mg kg-¹	M		< 1 [1]		
	TPH aromatic >C35-C44		mg kg-¹	N		< 1 [1]		
	Total Petroleum Hydrocarbons		mg kg-¹	N		< 10 [1]		
2700	Naphthalene	91203	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Acenaphthylene	208968	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Acenaphthene	83329	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Fluorene	86737	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Phenanthrene	85018	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Anthracene	120127	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Fluoranthene	206440	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Pyrene	129000	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Benzo[a]anthracene	56553	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Chrysene	218019	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Benzo[b]fluoranthene	205992	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Benzo[k]fluoranthene	207089	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Benzo[a]pyrene	50328	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	< 0.1	< 0.1		< 0.1
	Total (of 16) PAHs		mg kg-¹	M	< 2	< 2		< 2

[1]No sampling date was specified, stability times for this analyte may have been exceeded and these results may be compromised and will not be accredited (UKAS/MCerts)

* Accreditation status

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LABORATORY TEST REPORT
Asbestos in Soils

Results of analysis of 2 samples
received 10 September 2012
723931 - 134-136 Gloucester Avenue, Camden

Report Date
18 September 2012

Login Batch No: 212556

Qualitative Results

				SOP 2190	
				ACM Type	Asbestos Identification
Chemtest ID	Sample ID	Sample Desc	Depth (m)		
AH71984		WS1	0.30	-	No Asbestos Detected
AH71994		WS5	0.30	-	No Asbestos Detected

The detection limit for this method is 0.001%

Signed

Albert Vella
Senior Environmental Surveyor

Appendix D

Generic Assessment Criteria

Assessment Criteria – Human Health (soil)

Substance	Criteria Source	Residential			Industrial and Commercial		
Metals							
Arsenic	SGV 05.09	32			640		
Cadmium	SGV 07.09	10			230		
Chromium, III (total)	LQM/CIEH	3000			3.04 E+04		
Chromium, IV	LQM/CIEH	4.3			35		
Copper	LQM/CIEH	2330			7.17 E+04		
Lead	SGV 10	450			750		
Mercury	SGV 03.09	170			3600		
Nickel	SGV 03.09	130			1800		
Selenium	SGV 03.09	350			1.3 E+04		
Zinc	LQM/CIEH	3750			6.65 E+05		
Other Metals							
Antimony	EIC/AGS/CL:AIRE	550			7500		
Barium	EIC/AGS/CL:AIRE	1300			2.20 E+04		
Beryllium	LQM/CIEH	12			1950		
Boron	LQM/CIEH	291			1.92 E+05		
Molybdenum	EIC/AGS/CL:AIRE	670			1.70 E+04		
Vanadium	LQM/CIEH	140			4250		
TPHCWG carbon banding							
	Soil Organic Matter	1%	2.5%	6%	1%	2.5%	6%
aliphatic EC>5-6	LQM/CIEH	30	55	110	3400	6200	1.3E+4
aliphatic EC>6-8	LQM/CIEH	73	160	370	8300	1.8E+4	4.2E+4
aliphatic EC>8-10	LQM/CIEH	19	46	110	2100	5100	1.2E+4
aliphatic EC>10-12	LQM/CIEH	93	230	540	1.0E+4	2.4E+4	4.9E+4
aliphatic EC>12-16	LQM/CIEH	740	1700	3000	6.1E+4	8.3E+4	9.1E+4
aliphatic EC>16-35	LQM/CIEH	4.5E+4	6.4E+4	7.6E+4	1.6E+6	1.8E+6	1.8E+6
aromatic EC>5-7 (benzene)	LQM/CIEH	65	130	280	2.8E+4	4.9E+4	9.0E+4
aromatic EC>7-8 (toluene)	LQM/CIEH	120	270	611	5.9E+4	1.1E+5	1.9E+5
aromatic EC>8-10	LQM/CIEH	27	65	151	3700	8600	1.8E+4
aromatic EC>10-12	LQM/CIEH	69	160	346	1.7E+4	2.9E+4	3.45E+4
aromatic EC>12-16	LQM/CIEH	140	310	593	3.6E+4	3.7E+4	3.78E+4
aromatic EC>16-21	LQM/CIEH	250	480	770	2.8E+4	2.8E+4	2.8E+4
aromatic EC>21- 35	LQM/CIEH	890	1100	1230	2.8E+4	2.8E+4	2.8E+4
PAH Compounds							
	Soil Organic Matter	1%	2.5%	6%	1%	2.5%	6%
Acenaphthene	LQM/CIEH 2009	210	480	1000	8.5E+4	9.8E+4	1.0E+5
Acenaphthylene	LQM/CIEH 2009	170	400	850	8.4E+4	9.7E+4	1.0E+5
Anthracene	LQM/CIEH 2009	2300	4900	9200	5.3E+5	5.4E+5	5.4E+5
Benzo[a]anthracene	LQM/CIEH 2009	3.1	4.7	5.9	90	95	97
Benzo[a]pyrene	LQM/CIEH 2009	0.83	0.94	1	14		
Benzo[b]fluoranthene	LQM/CIEH 2009	5.6	6.5	7	100		
Benzo[ghi]perylene	LQM/CIEH 2009	44	46	47	650	660	660
Benzo[k] fluoranthene	LQM/CIEH 2009	8.5	9.6	10	140		
Chrysene	LQM/CIEH 2009	6	8	9.3	140		
Dibenzo[ah]anthracene	LQM/CIEH 2009	0.76	0.86	0.9	13		
Fluoranthene	LQM/CIEH 2009	260	460	670	2.3E+4		
Fluorene	LQM/CIEH 2009	160	380	780	6.4E+4	6.9E+4	7.1E+4
Indeno[123-cd]pyrene	LQM/CIEH 2009	3.2	3.9	4.2	60	61	62
Naphthalene	LQM/CIEH 2009	1.5	3.7	8.7	200	480	1100
Phenanthrene	LQM/CIEH 2009	92	200	380	2.2E+4	2.2E+4	2.3E+4
Pyrene	LQM/CIEH 2009	560	1000	1600	5.4E+4		
BTEX Compounds							
Benzene	SGV 03.09	0.33			95		
Toluene	SGV 03.09	610			4,400		
Ethylbenzene	SGV 03.09	350			2,800		
o-Xylene	SGV 03.09	250			2,600		
m-Xylene	SGV 03.09	240			3,500		
p-Xylene	SGV 03.09	230			3,200		
Other Compounds							
Cyanide, total	Dutch IV	50			50		
Phenol, total	SGV 06.09	420			3200		

Notes:

1. GAC based on sandy loam soil with SOM 6% (except TPH and PAH compounds)
2. All units mg kg^{-1}
3. Where GAC for TPH are exceeded, consider calculating SSAC to determine if risk is from ingestion (for which capping may be required) or from inhalation (for which vapour protection may be required)
4. GAC for TPH may be used as v-GAC for organic vapour assessment

Assessment Criteria – Controlled Waters

	EQS (µg l^{-1})			UK DWS (µg l^{-1})		EQS (µg l^{-1})	UK DWS (µg l^{-1})
List 1 dangerous substances							
	Fresh	Estuary	Marine				
Mercury	1	0.5	0.3	1	Endrin	0.005	0.1
Cadmium	5	5	2.5	5	Total 'Drins	0.03	-
Hexachlorocyclohexane	0.1	0.02	0.02	-	Hexachlorobenzene	0.03	-
Carbon tetrachloride	12			-	Hexachlorobutadiene	0.1	-
Total DDT	0.025			0.5	Chloroform	12	-
pp DDT	0.01			-	1,2-dichloroethane	10	-
Pentachlorophenol	2			0.1	Trichlorethylene	10	-
Dieldrin	0.01			0.03	Perchlorethylene	10	-
Isodrin	0.005			0.1	Trichlorobenzene	0.4	-
Aldrin	0.01			0.03			

List 2 dangerous substances						
1,1,1-Trichloroethane	100	-	Fenitrothion	0.01	0.1
1,1,2-Trichloroethane	400	-	Flucofuron	1	0.1
2,4-D (ester)	1	-	Iron	1000	200
2,4-D (non-ester)	40	-	Linuron	2	0.1
2,4-Dichlorophenol	20	-	Malathion	0.01	0.1
2-Chlorophenol	50	-	Mecoprop	20	0.1
4-Chloro-3-methyl-phenol	40	-	Mevinphos	0.02	0.1
Arsenic	50	10	Naphthalene (use for PAH)	10	0.1
Atrazine & Simazine	2	0.1	Omethoate	0.01	0.1
Azinphos-methyl	0.01	0.1	PCSDs	0.05	0.1
Bentazone	500	0.1	Permethrin	0.01	0.1
Benzene (use for TPH)	30	1	pH	6 - 9	6.5 - 10
Biphenyl	25	-	Sulcofuron	25	0.1
Boron	2000	1	Toluene	50	0.1
Chloronitrotoluenes	10	-	Triazaphos	0.005	0.1
Cyfluthrin	0.001	0.1	Tributyltin	0.02	0.1
Demeton	0.5	0.1	Trifluralin	0.1	0.1
Dichlorvos	0.001	0.1	Triphenyltin	0.02	0.1
Dimethoate	1	0.1	Xylene (m and p, o)	30	-
Endosulphan	0.003	0.1			

List 2 dangerous substances (hardness related)							
Hardness (mg l^{-1} $CaCO_3$)	0-50	>50 -100	>100 -150	>150 -200	>200 -250	>250	
Suitable for all fish							
Copper	1	6	10	10	10	28	2000
Nickel	50	100	150	150	200	200	20
Vanadium	20	20	20	20	60	60	-
Suitable for salmonid (game) fish							
Chromium	5	10	20	20	50	50	50
Lead	4	10	10	20	20	20	25
Zinc	8	50	75	75	75	125	-
Suitable for Cyprinid (coarse) fish							
Chromium	150	175	200	200	250	250	50
Lead	20	125	125	250	250	250	25
Zinc	75	175	250	250	250	500	-

Other Compounds			
Acrylamide	0.1	Tetrachloroethene and Trichloroethene	10
Antimony	5	Trihalomethanes (ii)	100
Benzo(a)pyrene	0.01	Vinyl chloride	0.5
Bromate	10	Aluminium	200
Cyanide	50	Iron	200
1, 2-dichloroethane	3	Manganese	50
Epichlorohydrin	0.1	Sodium	200
Fluoride	1.5	Tetrachloromethane	3
Heptachlor	0.03	Ammonium	0.5 mg l^{-1}
Heptachlor epoxide (iii)	0.03	Nitrate	50 mg l^{-1}
Other pesticides	0.1	Nitrite	0.5 mg l^{-1}
Pesticides (total)	0.5	Chloride	250 mg l^{-1}
Polycyclic aromatic hydrocarbons (i)	0.1	Sulphate	250 mg l^{-1}
Selenium	10	TPH (1989 Regs)	10

Notes:

i. Specified compounds are benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]-perylene, indeno[1,2,3-c,d]pyrene.
ii. Specified compounds are chloroform, bromoform, dibromochloromethane, bromodichloro-methane.

Unless stated otherwise all units µg l^{-1}

Substance [1]	WRAS (withdrawn)	Anglian Water	UK WIR	
			PE	PVC
Organic compounds				
TPH	50	50 – 1000 [2]	-	
TPH >C5-C10	-	-	2	1.4
TPH >C11-C20	-	-	10 [3]	NL
TPH >C21-C40	-	-	500 [3]	NL
Extended VOC suite	-	-	0.5 [3]	0.125 [3]
Extended SVOC suite	-	-	2 [3]	1.4 [3]
BTEX + MTBE	-	-	0.1	0.03
Chlorinated hydrocarbons				
Dichloromethane	-	1	-	-
1,2-dichloroethane	-	0.2	-	-
1,1,1-trichloroethane	-	8	-	-
1,2-dichloropropane	-	0.1	-	-
Tetrachloromethane	-	0.15	-	-
Trichloroethene	-	1.5	-	-
Tetrachloroethene	-	0.5	-	-
Vinyl chloride	-	0.1	-	-
Methyl bromide	-	10	-	-
Total	-	7	-	-
Aromatic hydrocarbons				
Benzene	-	0.5	0.1	0.03
Ethylbenzene	-	0.5	0.1	0.03
Trimethyl benzene	-	0.1	-	-
Propylbenzene	-	2	-	-
Toluene	-	0.25	0.1	0.03
Xylenes	-	0.5	0.1	0.03
Phenol	5	1	2 [3]	0.4 [3]
Cresol	-	1	2 [3]	0.04 [3]
Total	-	7	-	-
Chlorinated phenols				
Chlorophenols	-	0.5	-	-
Dichlorophenols	-	0.5	-	-
Trichlorophenols	-	0.5	-	-
2,4,6-trichlorophenol	-	0.5	-	-
Pentachlorophenol	-	0.5	-	-
Total	-	1	2 [3]	0.04 [3]
Chlorinated aromatic hydrocarbons				
Chlorobenzene	-	0.5	-	-
Dichlorobenzene	-	0.5	-	-
Trichlorobenzene	-	0.5	-	-
Pentachlorobenzene	-	0.5	-	-
Total	-	1	-	-
Polyaromatic hydrocarbons				
Naphthalene	-	5	-	-
Anthracene	-	10	-	-
Phenanthrene	-	10	-	-
Fluoranthene	-	10	-	-
Pyrene	-	10	-	-
Benzo[a]pyrene	-	1	-	-
Total	50	20	2	1.4
Other organic compounds				
Tetrahydrafurane	-	4	-	-
Styrene	-	5	-	-
Pyridine	-	2	-	-
Ethers	-	-	0.5	1
Nitrobenzene	-	-	0.5 [3]	0.4 [3]
Ketones	-	-	0.5 [3]	0.02 [3]
Aldehydes	-	-	0.5	0.02
Amines	-	-	Detected	NL

Notes:

1. All units mg kg^{-1} in soil.
2. The threshold for TPH is 1000mg kg^{-1} provided no other organic compounds are present. If the TPH level exceeds 50mg kg^{-1} then the sum of TPH plus other organic compounds must not be greater than the upper threshold. If the other compounds are not tested for then the threshold for TPH must be set at the lower threshold.
3. All UKWIR TV's (except BTEX and MTBE) are based on taste and odour detection threshold.
4. PE – polyethylene; PVC – polyvinyl chloride

Appendix E

Defining Risk

Risk Assessment

The environmental risks identified for each pollutant linkage shown in the Conceptual Model and Risk Assessment (section 4) has been derived using a matrix based on the model provided in CIRIA C552 Contaminated Land Risk Assessment, A guide to Good Practice, which considers both the magnitude of consequence and the likelihood of occurrence.

The overall risk is determined by using a worst case scenario matrix as follows.

		Likelihood of Occurrence				
		Almost Certain	**Likely**	**Possible**	**Unlikely**	**Very Unlikely**
Potential Magnitude of Consequence	**Severe**	Very High	High	Moderate	Low	Low
	Moderate	High	Moderate	Moderate	Low	Very Low
	Mild	Moderate	Moderate	Low	Very Low	Very Low
	Negligible	Low	Low	Very Low	Very Low	Very Low

Input for the matrix above is based on the following scenarios for the potential magnitude of the consequence and the likely occurrence of the event.

Potential Magnitude of the Consequence

Severe	• Permanent damage to buildings and structure • Long term irreversible damage to human health • Acute contamination of groundwater and/or surface water
Moderate	• Major (but reversible) damage to buildings and structures. • Long term (but curable) effects on human health • Heavy contamination of groundwater and /or surface water
Mild	• Minor reversible damage to building and structure • Short term effects on human health. • Minor contamination of groundwater and/or surface water
Negligible	• Very little or no damage to buildings and structures. • Very minor, short term or no effects on human health. • Very little or no contamination of groundwater and/or surface water

Likelihood of Occurrence

Almost Certain	• There is a clear pollutant linkage and circumstances are such that an event will inevitably occur or there is already evidence of harm to receptors
Likely	• There is a pollutant linkage and circumstances are such that an event is likely to occur in either the long or short term
Possible	• There is a pollutant linkage and circumstances are possible under which the event could occur in the sort term but more likely in the long term
Unlikely	• There is a pollutant linkage and circumstances are possible under which the event could occur. It is however, unlikely in long term and even less so in the short term
Very Unlikely	• There is a pollutant linage however circumstances are such that it is unlikely that an event would ever occur