Desk Study and Ground Investigation Report

15-17 Macklin Street
London WC2

Client	Durley Investment Corporation
Engineer	Price & Myers

J11081

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GEA Geotechnical & Environmental Associates

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EXECUTIVE SUMMARY

Part 1: INVESTIGATION REPORT

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a site investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Price and Myers, on behalf of Durley Investment Corporation, with respect to the addition of a single storey to the existing three-storey building for a commercial end use. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions, to assess the extent of any contamination and to provide information to assist with the design of any modifications that might be necessary to the existing foundations as a result of the proposals.

DESK STUDY FINDINGS

The desk study has indicated that Macklin Street previously known as Lewknor's Lane, formed on the site of Rose Field, an area of pasture land. Some of the houses on the street were built as early as 1627. Lewknor's Lane was subsequently changed to Charles Street and renamed Macklin Street in 1878. Historical maps indicate that the site has been occupied by the existing buildings since before 1878, the date of the earliest OS map studied. The site has remained unchanged to the present day. The historical use of the building is not known and Kelly's directories did not provide any further information on the historical use of the site, but it has the appearance of having had a commercial use, possibly a combination of offices and storage. The site is currently vacant.

GROUND CONDITIONS

The investigation encountered a significant thickness of made ground underlain by the Langley Silt, overlying the Lynch Hill Gravel, which was proved to the maximum depth of sampling, at 5.0 m, and is believed to be underlain by the London Clay Formation. The made ground extended to depths of between 2.1 m and 3.0 m and typically comprised brown silty sandy gravelly clay with fragments of brick, ash, plastic, glass and concrete. The underlying Langley Silt was only recorded in Borehole Nos 1 and 3, to a depth of 2.9 m, and comprised firm light orange-brown silty sandy clay with occasional fine to medium subangular to subrounded flint gravel. The Lynch Hill Gravel generally comprised light orange-brown fine to medium sand and fine to coarse angular to subrounded flint gravel. Dynamic probe tests carried out adjacent to the boreholes indicate that the Lynch Hill Gravel is initially medium dense rapidly becoming very dense. The density of the gravel prevented further sampling of this stratum and dynamic probing could not penetrate below a depth of 3.9 m. Information from borehole records available online from the British Geological Survey, indicates the London Clay to be present at approximately 6 m below ground level, approximately 100 m to the south of site.

Groundwater was encountered during the investigation in Borehole No 2 only at a depth of 4.0 m from within the Lynch Hill Gravel.

The existing foundations bear within the made ground or Langley Silt at depths of between 0.80 m and 3.00 m.

The chemical analysis on four samples of made ground revealed no elevated concentrations in excess of the generic risk based screening values for a commercial end use. High concentrations of total organic carbon have been recorded within two samples of made ground from Borehole Nos 1 and 2 at a depth of 1.5 m.

RECOMMENDATIONS

The existing foundations are assumed to have completed settlement in view of the age of the building. It should therefore be possible to apply a load of similar magnitude to that initially exerted on the soil, without excessive settlement or failure. Only in one instance, where there is an increase in load and the existing foundation is bearing on made ground, is there considered to be a requirement for underpinning of the foundations. New moderately sized spread foundations bearing in the Lynch Hill Gravel at a minimum depth of 0.75 m may be designed to apply a net allowable bearing pressure of 250 kN/m². The elevated concentrations of total organic carbon are likely to be of natural origin as total PAH is not elevated. The site will remain entirely covered by the existing buildings and as such no pathway for the contaminants to reach sensitive receptors is anticipated and remedial measures should not be necessary.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Price and Myers, on behalf of Durley Investment Corporation to carry out a site investigation at 15-17 Macklin Street, London, WC2B 5NG.

1.1 Proposed Development

It is understood that the current proposal is the construction of an additional storey to the existing three-storey building at No 17 Macklin Street. In addition there will be a new roof and some internal alterations to both Nos 15 and 17 Macklin Street, including new columns and lowering of the ground floor slab by approximately 600 mm if the existing foundations allow.

The loads will change and modifications to the existing foundations may be necessary as a result of the proposals. The building is being refurbished for a commercial end-use.

This report is specific to the proposed development and the advice herein should be reviewed, once the development proposals are finalised.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site and surrounding area with respect to previous contaminative uses;
- to determine the ground conditions and their engineering properties;
- to determine the configuration of the existing foundations;
- to provide advice with respect to ground movements associated with the addition of load to the existing foundation and the design of new foundations;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of readily available geological maps;
- to check records of data on groundwater, surface water and other publicly available environmental data;

- a review of a range of internet sources;
- a review of the Post Office / Kelly's directories on the historical use of the site held by the London Metropolitan Archives; and
- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database.

In the light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- five window sample boreholes, extended to a maximum depth of 5.0 m;
- five dynamic probes advanced to a maximum depth of 3.9 m to obtain information on the strength of the soils;
- twelve hand-dug trial pits excavated to a maximum depth of 3.02 m in order to expose the existing foundations;
- laboratory testing of selected soil samples for geotechnical purposes and for the presence of contamination; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11[1] and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

1 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004

2.0 THE SITE

2.1 Site Description

The site is located approximately 500 m southwest of Holborn London Underground station. It fronts onto Macklin Street to the south and is bounded to the east by a two-storey residential property and to the west by a six-storey building, used as offices and retail. The site may be additionally located by National Grid Reference 530360, 181350.
The site is sensibly level and is occupied by an L-shaped three-storey pitched roof building attached to a five-storey pitched roof property. The entire footprint of the site is covered by these two buildings and measures approximately 20 m by 15 m. The site is devoid of vegetation and is currently vacant.

2.2 Site History

The site history has been researched by reference to internet sources and historical Ordnance Survey (OS) maps obtained from the Envirocheck database.

The desk study has indicated that the site that Macklin Street was previously known as Lewknor's Lane, formed on the site of Rose Field, an area of pasture land. Some of the houses on the street were built as early as 1627. Lewknor's Lane was subsequently changed to Charles Street and renamed Macklin Street in 1878. Historical OS maps indicate that the site has been occupied by the existing buildings since before 1878, the date of the earliest map studied. The site has remained unchanged to the present day.

Reference to Post Office / Kelly's directories did not provide any further information on the historical use of the site, but it has the appearance of having had a commercial use, possibly a combination of offices and storage. Google Street View indicates that No 15 Macklin Street has until recently been used by London City College. The site is currently vacant.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search can be provided if required.

The Envirocheck report lists a historic landfill 369 m east of the site at Lincoln Inn Fields, Portugal Street. In view of its age and distance from the site it is not considered to represent a risk. In addition to the historic landfill, the Envirocheck report lists a single registered waste treatment or disposal site, located 408 m east of the site which was authorised to incinerate less than 10,000 tonnes per year. The licence lapsed in 1991 and is not considered to present a risk to the site.

The search has also indicated that there have been ten pollution incidents to controlled waters within 1 km of the site, the closest being 365 m north of the site, classified as a minor incident.

Reference to records compiled by the Health Protection Agency (formerly the National Radiological Protection Board) indicates that the site falls within an area where less than 1% of homes are affected by radon emissions and therefore radon protective measures will not be necessary.

The site is not listed as being within a nitrate vulnerable zone or any other area of sensitive land use.

The Crossrail route will pass under the site and it may be appropriate to carry out an analysis of the likely settlement from the construction of the tunnel, to avoid or reduce any risk of movements induced by the tunneling being attributed to the proposed alterations to the building.

2.4 Geology and Hydrogeology

The British Geological Survey map of the area (Sheet 256) indicates that the site is underlain by Lynch Hill Gravel overlying London Clay. The Lynch Hill Gravel is classified as a Secondary Aquifer, whilst the underlying London Clay is classified as unproductive strata.

The nearest surface water feature is 761 m southeast of the site. Groundwater flow is likely to be in a southerly to southeasterly direction, towards the River Thames. The site is not in an area liable to flooding from rivers or sea without defences as defined by the Environment Agency.

The site is not located within a Groundwater Source Protection Zone, as defined by the Environment Agency. The nearest listed water abstraction is 760 m northwest of the site.

2.5 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.5.1 Source

The historical usage of the site that has been established by the desk study and the site walkover indicates that the site does not have a potentially contaminative history, by virtue of it having been occupied by the existing building, since before 1878. There are thus no obvious likely sources of contamination on the site or in its immediate vicinity.

2.5.2 Receptor

The entire site will be covered by the commercial building and therefore the end users of the site represent a relatively low sensitivity end use. The granular soils beneath the site are classified as a Secondary Aquifer, and as such groundwater represents a moderately sensitive receptor. Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are likely to come into direct contact with any contaminants present in the soil and through inhalation of vapours during construction.

2.5.3 Pathway

The site is likely to be directly underlain by a Secondary Aquifer and a pathway for the migration of contaminants on or off site may exist. The likely presence of negligibly permeable London Clay at depth beneath the site will limit the potential for groundwater percolation into the underlying chalk aquifer, and thus a pathway is not considered likely to exist to the Principal Aquifer.

There will be a limited potential for contaminants to move onto or off the site, except horizontally within any made ground or underlying sands and gravels. There is thus considered to be limited potential for a significant contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

Within the site, end users will be isolated from direct contact with any contaminants present within the made ground by the presence of the building. Thus no potential contaminant exposure pathways exist with respect to end users. Buried services may be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the soils during construction works. There is thus considered to be a low potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

2.5.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a VERY LOW risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work. There is also a very low risk of landfill gas.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, four window sample boreholes were advanced from ground level to a maximum depth of 5.0 m and a single borehole was advanced through the base of Trial Pit No 5 to a depth of 3.4 m with electrical equipment. Dynamic probing was carried out in positions adjacent to Borehole Nos 1 to 4 and through the base of Trial Pit No 11 to obtain information on the density of the soil, to a maximum depth of 3.9 m. In addition to the boreholes and dynamic probes, twelve hand-dug trial pits were initially excavated by a third party to expose the existing foundations to depths of between 0.83 m and 2.24 m. Nine of the twelve trial pits were subsequently deepened by GEA to depths of between 1.85 m and 3.10 m to provide the required information.

All of the above work was carried out under the supervision of a geotechnical engineer from GEA.

A selection of the disturbed samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

The borehole and dynamic probe records and results of the laboratory analyses are appended, together with a site plan indicating the exploratory positions.

3.1 Sampling Strategy

The borehole and dynamic probe locations were specified and positioned by GEA to provide optimum coverage of the site with due regard to the proposed development, whilst avoiding the areas of known services and the trial pit locations were specified by the consulting engineers.

Laboratory geotechnical classification and strength tests were undertaken on samples of the natural soil.

Four samples of made ground were subjected to analysis for a range of common industrial contaminants and contamination indicative parameters. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification.

The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. Details of the MCERTs accreditation and test methods are included in the Appendix together with the analytical results.

4.0 GROUND CONDITIONS

The investigation encountered significant thickness of made ground underlain by the Langley Silt, overlying the Lynch Hill Gravel, which was proved to the maximum depth of sampling, at 5.0 m.

4.1 Made Ground

Below the ground floor slab the made ground extended to depths of between 2.1 m and 3.0 m and typically comprised brown silty sandy gravelly clay with fragments of brick, ash, plastic, glass and concrete.

Apart from the presence of extraneous material such as brick, concrete, plastic, glass and ash no olfactory evidence of contamination was observed within these soils during the investigation. Four samples of the made ground were analysed for a range of contaminants and the results are summarised in Section 4.6.

4.2 Langley Silt

The underlying Langley Silt was only recorded in Borehole Nos 1 and 3, to a depth of 2.9 m, and comprised firm light orange-brown silty sandy clay with occasional fine to medium subangular to subrounded flint gravel.

Laboratory plasticity index tests indicate the clay to be of low volume change potential.

These soils were observed to be free of any evidence of soil contamination

4.3 Lynch Hill Gravel

The Lynch Hill Gravel generally comprised light orange-brown fine to medium sand and fine to coarse angular to subrounded flint gravel.

Dynamic probe tests carried out adjacent to the boreholes indicate that the Lynch Hill Gravel is initially medium dense rapidly becoming very dense. The density of the gravel prevented further sampling of this stratum and dynamic probing could not penetrate below a depth of 3.9 m.

Information from borehole records available online from the British Geological Survey, indicates the London Clay to be present at approximately 6 m below ground level, approximately 100 m to the south of site.

A borehole has been carried out adjacent to the site at National Grid Reference 530358, 181327 for the Crossrail Project. Access to this record is restricted and written confirmation from the owners is required for its release. However, it would be useful to obtain this borehole record to confirm the level of the London Clay beneath the site to ensure that it will not be overstressed.

4.4 Groundwater

Groundwater was encountered during the investigation from within the Lynch Hill Gravel in Borehole No 2 only at a depth of 4.0 m

4.5 Existing Foundations

Twelve trial pits were excavated, to a maximum depth of 3.1 m, to expose the footings of the internal, external and party walls.

Trial Pit Nos 10 and 12 revealed that the party walls at these locations are bearing on made ground at depths of between 0.82 m and 1.80 m.

Information from Trial Pit No 3 indicates that the existing foundation of the northern elevation of No 17 Macklin Street is apparently bearing on made ground at a depth of 3.0 m. However, space in this pit was very constricted and Borehole No 2, drilled approximately 2.0 m to the southeast of this trial pit encountered Lynch Hill Gravel at a depth of 2.9 m. The foundation, if it is bearing on made ground, is therefore likely to be very close to the top of the Lynch Hill Gravel.

Information from Trial Pit Nos 1, 4, 5, 6, 7, 8 and 9 indicates that the existing foundations of No 17 Macklin Street on the northern and eastern boundary walls, central column, southern elevation, internal eastern, southern and western walls are apparently bearing on Langley Silt at depths of between 1.17 m and 3.0 m.

Trial Pit Nos 2 and 11 were terminated at depths of between 0.80 m and 1.62 m due to internal walls that obscured access and prevented further progress. In addition internal walls were encountered in Trial Pit Nos 2, 3, 4 8, 10 and 11.

On the basis of the trial pit findings and the significant thickness of made ground encountered during the investigation it is thought possible that the previous building on the site had a basement which has since been infilled.

Groundwater was not encountered in any of the trial pits.

Trial pit logs and photographs are included in the Appendix.

4.6 Soil Contamination

The table below sets out the values measured within four samples analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	BH1: 1.5 m	BH2: 1.5 m	BH4: 2.5 m	BH5: 3.0 m
pH	6.5	6.8	7.1	7.6
Arsenic	12	10	10	16
Cadmium	0.11	<0.10	<0.10	0.11
Chromium	18	18	19	19
Copper	130	70	82	55
Mercury	1.4	1.5	0.59	1.1
Nickel	22	21	22	21
Lead	370	120	85	180
Selenium	0.35	0.35	0.22	0.33
Zinc	110	81	85	67
Total Cyanide	<0.50	<0.50	<0.50	<0.50
Total Phenols	<0.3	<0.3	<0.3	<0.3
Total Sulphate	1600	1100	800	900
Sulphide	2.4	1.9	1.4	0.79
Soluble Chloride (g/l)	0.087	0.019	<0.010	0.05
Total TPH	<10	<10	<10	<10
Total PAH	<2	<2	<2	<2
Benzo(a)pyrene	<0.1	<0.1	<0.1	<0.1
Naphthalene	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon %	**12**	**30**	4.4	2.0

Note: Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed below

4.6.1 Generic Risk Based Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end the contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[3] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a commercial end use.

2 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

The key generic assumptions for the commercial end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be a working female aged 16 to 65 years old;
- that the exposure duration will be 49 years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a three-storey office.

It is considered that these assumptions are acceptable for this generic risk assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

The concentration ranges of the contaminants of concern highlighted by a comparison of the measured concentrations against the generic screening values are tabulated below. This assessment is based upon the potential for risk to human health, which at this site is considered to be the critical risk receptor.

Contaminant of Concern	Maximum concentration recorded (mg/kg)	Locations where elevated concentrations recorded	Generic Risk-Based Screening Value
Total Organic Carbon	30	BH1: 1.5 m; BH2: 1.5 m	10
**Threshold values marked thus are for compounds with a limited human toxicity hence the threshold values adopted are not derived on a risk based methodology. Justification for all of the values quoted is provided in the appended table of Generic Risk Based Threshold Soil Guideline Values*			

When comparing the results from the contamination testing to those in the Soil Guideline Values and Generic Guideline Values, the analyses have revealed no elevated concentrations in excess of the generic risk based screening values for a commercial end us. High concentrations of total organic carbon have been recorded within two samples of made ground in Borehole Nos 1 and 2 at a depth of 1.5 m.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to foundation options and contamination issues.

5.0 INTRODUCTION

It is understood that the current proposal is the construction of an additional storey to the existing three-storey building at No 17 Macklin Street. In addition there will be a new roof and some internal alterations to both Nos 15 and 17 Macklin Street, including new columns and lowering of the ground floor slab by approximately 600 mm if the existing foundations allow. Modifications to the existing foundations may be necessary as a result of the proposals.

6.0 GROUND MODEL

The desk study has revealed that the site has not had a potentially contaminative history, having apparently been occupied by the existing building since before 1878 and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows.

- Beneath a significant thickness of made ground, Langley Silt is present overlying the Lynch Hill Gravel, which was proved to the maximum depth sampled of 5.0 m;
- the made ground extended to depths of between 2.1 m and 3.0 m and typically comprised brown silty sandy gravelly clay with fragments of brick, ash, plastic, glass and concrete;
- the underlying Langley Silt is apparently of uneven distribution, and was only recorded in Borehole Nos 1 and 3, to a depth of 2.9 m; it comprised firm light orange-brown silty sandy clay with occasional fine to medium subangular to subrounded flint gravel;
- the Lynch Hill Gravel generally initially comprised medium dense becoming very dense light orange-brown fine to medium sand and fine to coarse angular to subrounded flint gravel and was sampled to the maximum depth of the investigation, at 5.0 m;
- BGS boreholes indicate the London Clay Formation to be present at a depth of approximately 6 m below ground level;
- groundwater was encountered during the investigation in Borehole No 2 only at a depth of 4.0 m from within the Lynch Hill Gravel; and
- chemical analysis on four samples of made ground revealed no elevated concentrations in excess of the generic risk based screening values for a commercial end use. It should be noted that high concentrations of total organic carbon have been recorded within two samples in Borehole Nos 1 and 2 at a depth of 1.5 m.

7.0 ADVICE AND RECOMMENDATIONS

The existing foundations comprise a range of strip footings and pad foundations bearing on made ground or Langley Silt at depths of between 0.80 m and 3.0 m, understood to be supporting loads that range from approximately 105 kN/m to 421 kN/m, applying pressures of between 96 kN/m² and 384 kN/m².

It is proposed to use the existing foundations, together with three new columns, to support new loads of between 127 kN/m to 319 kN/m, applying pressures of between 90 kN/m² and 420 kN/m².

The criteria that must be satisfied in the design of additional load are firstly that the ultimate bearing capacity of the bearing stratum is not exceeded, and secondly that a sufficient factor of safety is operating for the additional load, which will in turn keep settlements as a result of the additional load within tolerable limits.

7.1 Spread Foundations

It is understood that the main alterations to the current foundations will take place in No 17 Macklin Street, specifically to the northern, eastern southern and western boundary walls, central columns and eastern internal wall. In No 15 Macklin Street, a central column will be constructed and there will be main alterations to the southern boundary wall.

7.1.1 Existing Foundations

The assumed existing and proposed new pressures are detailed in the table below. It is understood that the proposed new pressures are preliminary and may be subject to change as the scheme progresses.

Location of wall	Assumed existing pressures (kN/m²)	Proposed new pressures (kN/m²)	Change in pressures (kN/m²)
No 15: Western boundary wall	380	272	-108
No 15: Northern boundary wall	96	90	-6
No 15 Eastern boundary wall	324	215	-109
No 17: Eastern boundary wall	122	164	+42
No 17: Northern elevation	384	450	+66
No 17: Northern boundary wall	97	117	+20
No 17: Western boundary wall	344	420	+76
No 17: Internal eastern wall	187	210	+23
No17: Southern elevation	206	249	+43

There does not appear to be any indication of movement of the existing foundations or structural distress of the building. The existing building is believed to have been constructed prior to 1878 and settlement that would occur as a result of load from these foundations may therefore be assumed to be complete. It should therefore be possible to apply a load of similar magnitude to that initially exerted on the soil, without excessive settlement or failure,

provided the foundation is bearing on competent soil. Where current foundations are bearing in made ground, and the bearing pressure is being reduced no foundation work is required. However, at one location there is a proposed increased in pressure of 76 kN/m² from 344 kN/m² to 420 kN/m² and it is recommended that the existing foundation of the western boundary wall of No 17 Macklin Street is underpinned to a suitable depth to bear within the Lynch Hill Gravel to avoid excessive settlement, as the Langley Silt is not capable of accommodating pressures over 400 kN/m². This could be achieved by mass concrete underpinning. The presence of the former basement walls will mean that a certain amount of preparation work is likely to be required before underpinning can be completed.

The existing foundations of the northern, eastern and southern boundary wall and internal eastern wall of No 17 Macklin Street are apparently bearing on Langley Silt at depths of between 2.15 m and 3.0 m. As a guide, the Langley Silt may be able to cope with an additional incremental pressure of about 75 kN/m² without excessive settlement subject to a total pressure of approximately 400 kN/m².

Information from Trial Pit No 3 indicates that the northern elevation of No 17 Macklin Street is apparently bearing on made ground at a depth of 3.0 m. However, the space available in this trial pit was very constricted and it is likely to be founded on a thin layer of made ground underlain by the Lynch Hill Gravel. If further investigations confirm that the northern elevation of No 17 Macklin Street is founded on a thin layer of made ground it may be possible to treat the existing foundation as bearing on the Lynch Hill Gravel. In general, the Lynch Hill Gravel it should be possible to apply an additional pressure of about 200 kN/m² to foundations on the gravel without excessive settlement, and subject to a total pressure of approximately 700 kN/m².

The above recommendations with respect to increases in pressure and total pressure on the foundations are given as a guide and the acceptable values will vary depending on the size of the foundation, depth and, in the case of the Langley Silt, on the thickness of the bearing stratum. The values will therefore need to be checked once proposed loads are finalised.

7.1.2 New Foundations

New moderately sized spread foundations bearing in the medium dense to very dense sand and gravel of the Lynch Hill Gravel at a minimum depth of 0.75 m may be designed to apply a net allowable bearing pressure of 250 kN/m². This value includes an adequate factor of safety to protect against bearing capacity failure and should ensure that settlements remain within normal tolerable limits. The investigation has indicated a significant thickness of made ground and spread foundations may have extend to a depth of about 3.0 m to found within the Lynch Hill Gravel.

Care should be taken to ensure that the underlying London Clay is not overstressed, and an allowable bearing pressure of 125 kN/m^2 would be assumed in the London Clay, which is assumed to be present at approximately 6 m below ground level.

7.2 Ground Floor Slabs

It will be possible to lower the existing ground floor slab by approximately 600 mm without undermining the existing foundation and adopt a ground floor bearing slab.

7.3 Effect of Sulphates

Chemical analyses have revealed relatively low concentrations of soluble sulphate and near-neutral pH in samples of the soil, corresponding to Class DS-1 and AC-1s of Table 2 of BRE Special Digest 1 Part C (2005). The guidelines contained in the above digest should be followed in the design of foundation concrete.

7.4 Excavations

Based on the observations during the site investigation, it is considered unlikely to be feasible to form unsupported excavations within the made ground. Therefore temporary lateral support or battering of the excavation sides should be assumed to be necessary in order to comply with normal safety requirement.

Inflows of groundwater into shallow excavations are not generally anticipated, although seepages may be encountered from perched water within the made ground, particularly in the vicinity of existing foundations. Any such inflows should be suitably controlled by sump pumping.

7.5 Site-Specific Risk Assessment

The chemical analysis on four samples of made ground revealed no elevated concentrations in excess of the generic risk based screening values for a commercial end use. It should be noted that high concentrations of total organic carbon have been recorded within two samples of made ground from Boreholes Nos 1 and 2 at a depth of 1.5 m.

The site is not considered to have had a historical contaminative use. The source of the contamination is likely to be of natural origin as total PAH is not elevated, however, the measured concentrations could pose a potentially unacceptable risk to human health through direct contact, accidental ingestion or inhalation of soil or soil derived dust. The proposed refurbishment of the site does not incorporate any soft landscaping, with the site remaining entirely covered with the building and as such no pathway for the contaminants to reach sensitive receptors is anticipated, remedial measures should not be necessary.

Although end users will be effectively isolated from any contamination, the elevated contaminants could pose a potential risk to ground workers in the short term.

7.5.1 Site Workers

Site workers should be made aware of the contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE[4] and CIRIA[5] and the requirements of the Local Authority Environmental Health Officer.

4 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO

5 CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association

7.6 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are classified as accepting inert, non-hazardous or hazardous wastes in accordance with the EU waste Directive.

Based upon on the technical guidance provided by the Environment Agency[6] it is considered likely that the made ground from this site, as represented by the four chemical analyses carried out, would be generally classified as non-hazardous waste, the natural soils may be classified as an inert waste. However, this classification should be confirmed by the receiving landfill once the soils to be discarded have been identified. In order to finalise this classification it will probably be necessary to carry out further analyses including WAC CEN method bulk leaching tests if a classification of Inert waste is to be considered for the made ground and should be carried out upon representative samples from the waste stream once the extent of the materials to be discarded has been established. Such WAC leaching tests may not be necessary upon samples of natural soils which are to be disposed of as an inert waste as the site may be considered as having had an uncontaminated history.

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[7] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified. The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

6 Environment Agency May 2008. Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance WM2 Second Edition Version 2.2

7 *Regulatory Position Statement 'Treating non-hazardous waste for landfill - Enforcing the new requirement' Environment Agency 23 Oct 2007*