G.D.C. Partnership Consulting Engineers

52 HOLMES ROAD

PROJECT No. 7195

BASEMENT IMPACT ASSESSMENT FOR PROPOSED DEVELOPMENT AT 52 HOLMES ROAD

PREPARED FOR MAISON HENRY BERTRAND (ENGLAND) LTD

52 Holmes Road

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Basement Impact Assessment for Proposed Development at 52 Holmes Road

Prepared by David S Mole BEng CEng MICE

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Prepared by	Approved by	Date	Status	Revision
DSM	MDC	30/08/2016	Draft	-
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1.0 Introduction

1.1 GDC Partnership Ltd has been instructed to prepare a Basement Impact Assessment for a proposed development at 52 Holmes Road, London.

1.2 The purpose of this assessment is to consider the local conditions and existing property in relation to the construction of the proposed basement and to assess the potential impact on surrounding structures, hydrology and ground features.

1.3 Camden Council provides specific guidance in relation to basement construction and they require that a planning application is accompanied by a basement impact assessment which demonstrates that the impact on soil/ground conditions, hydrology and water flow, means of construction, use of the space and cumulative impact of basements approved or proposed. This basement impact assessment has been carried out in accordance with guidance published by London Borough of Camden and specifically Appendix E of the Arup report 'Guidance on Subterranean Developments'

1.4 Following the descriptions of the existing site and proposed development, the basement impact will be assessed using four stages:

Screening	to identify any matters of concern and to determine if a BIA is required or not.
Scoping	to identify potential impacts.
Site Investigation	provide information on the site to assess potential Impacts.
Impact assessment	evaluating direct and indirect implications of the proposed development.

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2.0 Existing Site

2.1 The existing site is occupied by a light industrial two storey building with lower and upper ground floor levels. The site is bounded by Holmes Road to the front and Regis Road to the rear. To the left is a modern five and six storey student accommodation building. To the right is 48-50 Holmes Road, which is a 23m long light industrial building of two storeys with a single storey front extension. To the front of 52 Holmes Road is space for car parking.

2.2 The general topography of the site is that the ground rises from Holmes Road to Regis Road at the rear. The existing lower ground floor is at external ground level at the front but is approximately 1.5m below ground level at the rear.

2.3 The building is accessed from ground level which leads to the lower ground floor. The upper ground floor is accessed via stairs and there are two large voids on the right hand side of this floor over the lower ground floor. The left hand wall is a loadbearing brickwork wall whilst the right hand wall is load bearing blockwork, which is broken up by vertical and horizontal steelwork which we presume provides lateral stability to the wall. The roof is supported on an exposed steel truss which spans full length from front to rear. The bottom chord of this truss is tied across to the left and right hand walls by CHS ties. The construction of the roof is hidden behind finishes, though there are a number of roof lights. The roof has a shallow pitch and falls from a central ridge to the front and rear.

2.4 The front wall is brickwork with piers in the corner and below the roof truss. There is a concrete ring beam visible at eaves level.

2.5 The rear wall is a brickwork wall and, as can be seen from externally, it is part of a continuous wall to the rear of 36-52 Holmes Road. It appears that the rear wall continued beyond No. 52 at a lower level.

2.6 The right hand wall of the building projects above the level of the roof by approximately 2m. This wall appears to be inside an older boundary wall with No. 54. The status of this wall with respect to the Party Wall Act will need to be confirmed by a party wall surveyor.

2.7 The British Geological map for the area indicates that the bedrock is London Clay with no superficial deposits. London Clay is subject to volume change due to changes in moisture content either seasonally or due to the effects of nearby tree. The nearest borehole records show London Clay overlain by up to 3m of made ground.

2.8 The Thames Water Asset Location Search shows that there is a 1143 x 787 combined sewer in Holmes Road. There are no available records of the depth of the sewer. There are no records of any drainage in Regis Road. A Thames Water Flooding enquiry was made and the response was that there was no record of flooding at the site due to surcharging of the public sewers.

2.9 A review of Camden Council Planning website has revealed that there are no current planning permissions granted for basements in the vicinity of the site. Guidance for Subterranean Development Figure 24 Basement Planning Applications does indicate planning permission for a basement at 63 Holmes Road however review of the planning website shows that this basement was not constructed and that a non-material amendment was made to regularise the omission of the basement. We have been advised by the client that the neighbouring property No 36 – 50 Holmes Road is considering a redevelopment which may include a part basement on the site and have been provided with ground floor and basement drawings for reference. These show a basement occupying the middle of the site with the basement being remote from the perimeter of the site. The available drawings have been included in Appendix D. There has been no planning application lodged for this site to date.

3.0 Proposed Development

3.1 The proposed development is to consist of five floors of residential accommodation over two floors of light industrial use. The upper ground floor will have access to the residential core at the level of Holmes Road. The upper ground floor occupies the current footprint. There will be a small mezzanine floor at the rear of the ground floor. The Architectural planning drawings are included in Appendix C

3.2 The lower ground floor will be around 3.5m below the level of Holmes Road and will occupy the full extent of the site. To the front will be a courtyard with a light well above. At the rear will be a narrow light well to the full width of the building. As the ground level at Regis Road end of the site is around 1.5m higher than the Holmes Road and then the basement will be around 5m below ground level at this end of the site.

3.3 The proposed lower ground floor will be formed using an embedded piled retaining wall around the full perimeter with a reinforced concrete liner wall. The detail design of the retaining wall will address the issues of limiting movement during and post construction and the requirements for temporary works during the construction however it is anticipated that two levels of temporary propping will be provided at ground level and above the proposed basement level to limit the horizontal deflection of the piled retaining wall. The design of the retaining wall and temporary propping will be the responsibility of the specialist contractor. In addition to soil retention, the basement wall will be required to provide a Grade 3 environment to the below ground spaces as defined in BS 8102. This can be achieved by either a tanking membrane applied to the face of the piled retaining wall and continuing under the lower ground floor slab or a drained cavity system installed inside the liner wall and above the lower ground floor slab. The choice of which system to use will be a decision for the whole of the design team in conjunction with the client. It is

anticipated that the piled retaining wall would be a secant piled wall not a contiguous piled wall to provide temporary resistance to the inflow of any ground water however it is noted that the site is underlain by London Clay and therefore any inflows would be low to negligible.

3.4 The depth of the existing sewer in Holmes Road is unknown, therefore it is assumed that the depth of the new basement will be below the level of the sewer and some pumped drainage will be required to deal with the drainage within the basement. Pumped drainage systems incorporate non-return valves so that the risk of flooding of the basement through the drainage system caused by surcharging of the public sewer is mitigated. Foul drainage from the upper floors can be taken to the sewer by gravity flow.

3.5 The existing site is all impermeable and hence all of the rainfall runs directly into the sewer. Camden Council's SPD requires that all new developments deal with rainwater using a hierarchy of sustainable drainage (SUDS). The use of infiltration techniques is not feasible in this location due to inappropriate soil conditions. Similarly attenuating rainwater in ponds or open features is not achievable on this size of site. Therefore the attenuation of rainwater will require to be a combination of green roof storage and below basement attenuation tanks. It is unlikely that the below ground storage system will flow Into the sewer by gravity and therefore pumping will be required and this will incorporate a non-return valve to mitigate the risk of flooding to the basement through the buildings below ground drainage system due to the surcharging of the public sewer. The below ground drainage system will be designed with non-return valves to ensure that flooding of the basement cannot occur due to surcharging of the adjacent sewer. The storm water drainage system will be deigned to reduce the runoff rate by 50% from the current rate based on building regulations rainfall of 0.014L/s/m^2 for a range of storm durations

based on a 1:100 year storm return period plus an allowance of 40% for climate change as per current Environment Agency guidelines.

4.0 Screening

4.1 The purpose of the screening is to identify if a basement impact assessment is required through the responses to a series of questions.

4.2 Surface flow and flood screening

	Question	Response	Comment
1	Is the site within the catchment of the pond chains on Hampstead Heath?	No	Site is not located within the catchment zones defined by Figure 14 of Camden Geological Hydrogeological and Hydrological study
2	As part of the proposed site drainage will surface flows (e.g. volume of rainfall and peak run-off) be materially changed from existing route?	No	The existing site is fully covered by hard surfaces being a mix of hardstanding and roof. The proposed development cannot therefore increase these.
3	Will proposed basement development result in a change in the proportion of hard surfaced/paved external areas?	No	The current proposal maintains the current ratio of hard surfaced/paved areas.
4	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	Yes	The proposed development is intended to have some green roof areas which will reduce the peak run off from the site
5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	The existing site is fully covered by hard surfaces being a mix of hardstanding and roof.
6	Is the site in an areas known to be at risk from surface water flooding such as South Hampstead, West Hampstead Gospel Oak and Kings Cross or is it at risk from flooding for example because the proposed basement is below the static water	No	Site not located in a surface water flood risk zone based on EA flood maps

	level of a nearby surface water feature		

The above assessment has identified the following potential issues:

- The proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses

4.3 Subterranean (ground water) Screening Assessment

	Question	Response	Comment
1a	Is the site located directly above an aquifer?	No	Reference to EA maps shows site not above aquifer.
1b	Will the proposed basement extend below the water table level?	Unknown	Soil is London Clay with low permeability and is unlikely to have a water table.
2	Is the site within 100m of a watercourse, well or spring line?	No	No known spring or well within 100m of site
3	Is the site within the catchment of the pond chains on Hampstead Hetah	No	Site is not located within the catchment zones defined by Figure 14 of Camden Geological Hydrogeological and Hydrological study
4	Will the proposed basement development result in a change to the proportion of hard surface or paved area?	No	Existing site is fully hard surfaced.
5	As part of the site drainage will more surface water be discharged to the ground)e.g. via soakaways and/or suds)?	No	Soakaways not expected due to presence of cohesive and low permeability substrata
6	Is the lowest level of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than mean water level in any local pond or spring line?	No	No ponds locally

The assessment identified the following potential issues to be addressed:

- The basement will extend below the water table.

4.4 Stability screening assessment

	Question	Response	Comment
1	Does the site include any slopes, natural or manmade, greater than 7°?	No	The site rises from front to rear at a slope of approximately 2°.
2	Will the proposed re-profiling of the site involve changes to the slopes at the boundary of the property?	No	No changes proposed to the existing site levels.
3	Does the development neighbour land slope including railway cuttings and the like greater than 7°?	No	Neighbouring land has a maximum slope of 2°.
4	Is the site within a wider hillside setting with general slope greater than 7°?	No	
5	Is London Clay the shallowest strata at the site?	Yes	Geological maps and nearby boreholes show London Clay
6	Will trees be felled as part of the proposed development and/or are any works proposed within the tree protection zones where trees are to be retained?	Yes	A small tree is located adjacent to the rear of the site and works will likely fall within the root protection zone.
7	Is there history of seasonal shrinkage swelling in the local area or site or evidence of such?	No	The site lies within the London Clay formation which has a well known tendency for volume change due to changes in moisture content but no evidence of movement was noted during walkover survey.
8	Is the site within 100m of spring or water course?	No	No known spring or well within 100m of site
9	Is the site previously worked ground?	No	No evidence of worked ground in history of site
10	Is the site within an aquifer? If so will the proposed basement extend beneath the water table such that dewatering may be required during the excavation?	No	Reference to EA maps shows site not above aquifer.
11	Is the site within 50M of the Hampstead heath ponds	No	Site is not located within the catchment zones defined by Figure 14 of Camden Geological Hydrogeological and Hydrological study
12	Is the site within 5m of the public highway or pedestrian right of way?	Yes	Proposed basement will abut the public highway to the front and rear
13	Will the proposed basement significantly increase the differential depth of foundation relative to	Yes	The foundation will increase the foundation depth although the foundation depths of adjacent properties

	neighbouring properties?		are unknown
14	Is the site within the exclusion zone of any tunnels?	No	Nearest tunnel is over 150m distance based on Google Maps

The above assessment has identified the following potential issues:

- London Clay is shallowest strata
- Works fall within the tree protection zone
- Site is within 5m of public highway.
- Proposed basement will significantly increase the differential foundation depth with neighbouring properties.

5.0 Scoping

5.1 The purpose of the scoping is to define the matters of concern identified in the screening process.

5.2 Surface flow and flood

The following potential impacts have been identified:

Potential Issue	Possible Consequence
The proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	Changes in the flow regime could cause the ground water level in the zone of the new flow route to increase or decrease locally. Dewatering to construct the basement can cause ground water settlement and the zone of settlement may extend beyond the site boundary.

5.2 Subterranean (ground water) flow

The following potential impacts have been identified:

Potential Issue	Possible Consequence
The basement will extend below the water table.	Changes in the flow regime could cause the ground water level in the zone of the new flow route to increase or decrease locally. Dewatering to construct the basement can cause ground water settlement and the zone of settlement may extend beyond the site boundary.

5.3 Slope and ground stability

Potential Issue	Possible Consequence
Is London Clay the shallowest strata at site?	Settlement/heave associated with unloading caused by basement excavation including short and long term heave movement, settlement associated with retaining walls and underpinning and consequential ground movement around the basement perimeter
Will trees be felled as part of the proposed development and/or are	Whilst the tree is located outside of the proposed development the roots of the tree may extend under the existing building and be damaged by

any works proposed within the tree protection zones where trees are to be retained?	the proposed works.
Is site within 5m of highway or pedestrian right of way?	Loss of support to the ground beneath the pathway if basement excavation is inadequately supported. The edge of the basement light well is only just within 5m of edge of highway
Will the proposed basement significantly increase the differential depths of foundations relative to neighbouring properties?	Long term differential movement between basement and adjoining structure. The structural design will have to take into account the soil conditions and loading on the foundations to limit any differential movement

6.0 Site Investigation

6.1 A ground investigation has been carried out by Site Analytical Services Ltd and consists of a Phase 1 Assessment Ref 16/25450 dated August 2016 and a Phase 2 Ground Investigation Ref 16/25450-1 dated August 2016. A copy of the Phase 2 report is included in Appendix B, the Phase 1 report is not included due to its large file size but is available if required. The investigation consisted of two boreholes including installation of groundwater monitoring standpipe and three trial pits to expose exiting foundations on site along with sampling insitu and laboratory testing to determine engineering properties of the soils found and contamination testing of samples along with an interpretative report.

6.2 The ground conditions were found to be generally consistent with the geological records and consisted of Made Ground up to 1m deep overlying London Clay proven to a depth of 20m. Ground water was not encountered in any of the boreholes during the investigation and the material remained dry. Subsequent monitoring identified ground water at a depth of 5.10m and 4.72m below ground level in boreholes 1 and 2 respectively.

6.3 The trial pits revealed that the party wall to No 48-50 has a brick spread footing founded on Made Ground at 0.4m below ground level. The trial pit to the rear showed brickwork extending to 0.43m below ground floor level on 0.22m high concrete plinth on a stepped concrete slab the underside of which was not found due to the width a similar situation existing on the trial pit on the wall adjacent to No 54 except there was no concrete plinth.

7.0 Basement Impact Assessment

7.1 Surface Flow and Flooding

The existing site is fully hard surfaced with either roof or paving and the rainfall flows from the site in an unrestricted manner into the existing combined sewer in Holmes Road. The proposed development will alter the peak run off from the site by use of Green roof and attenuation tanks to limit the runoff from the site to at least 50% of the current Building Regulations run off of 0.014L/s/m^2 for a range of durations for a 1:100year storm return period including a 40% increase for climate change. The reduction of the peak run off is a planning requirement. With the existing rainwater flowing into a combined sewer this reduction in the peak run off will be beneficial to the environment not detrimental as it will contribute to a reduction in flooding risk. As the site is fully hard surfaced and the general ground conditions are London Clay which has low permeability there is no current natural storage off runoff in the ground in the area proposed to be the new basement.

7.2 Subterranean (ground water) flow

The ground in this location was found to be London Clay which is a cohesive soil with low permeability. The site is not located in the area of an aquifer. The ground water monitoring has found that the level is between 4.72 and 5.1m below Ground Level. It is not expected that there is any significant flow of water in or around the vicinity of this site. The impact of this basement to any flow of ground water would be minimal in any case as it is the only known full basement within the adjacent properties and hence any water flows would pass around the basement and the increase in water levels around the site would be negligible. The proposed basement will need to be fully waterproofed in order to provide adequate protection from ingress of moisture present in the ground and this should be designed in accordance with BS 8102. The

basement retaining walls should be designed for a water level 1m from the top of the wall in addition to the lateral loads from soil pressure and imposed surcharges.

7.2 Slope and Ground Stability

7.2.1 The existing tree adjacent to the rear of the site is only a semi mature tree however the roots may extend below the existing building and would be damage by the development. The tree is immediately adjacent to the neighbouring buildings façade and will clearly require ongoing maintenance pruning to prevent its undue growth. The Construction of the basement may impact on the roots of the tree but it is not considered that this impact will be significant.

7.2.2 The soil below the site is London Clay which is prone to volume change due to changes in moisture content the result of the testing on samples from the investigation show that the London Clay has a Plasticity Index of between 36 and 42 which would be considered as high volume change potential. The adjacent tree will have no effect on the foundation design of the proposed development as the piled retaining wall will be founded at a depth below the zone of influence of the tree and should a basement raft be utilised for the foundation of the building this too will be substantially below the zone of influence of the tree.

7.2.3 Heave of the London Clay is likely to occur immediately following the excavation for the basement and this is when the greatest movement will occur. As this occurs at the end of excavation, the effect of this is mitigated by the time required for the excavation and the ability to trim the formation immediately before construction of the basement slab.

7.2.4 The basement excavation is within 5m of the back of the pavement. However, the construction methodology proposed for the formation of basement areas is

to form an embedded piled retaining wall around the area to be excavated which will form both the temporary and permanent retaining wall to these areas. This piled wall will be designed to limit lateral movements to 5mm. In the permanent condition the piled retaining wall will be propped at ground and basement level and during construction the wall will be temporarily propped to ensure that the movements of the ground are limited.

7.2.5 Both the permanent and temporary works designs will be carried out by engineers experienced in each type of work and the work will be carried out by an experienced contractor. It is expected that a Ground Movement Assessment will be carried out as part of the development of the design.

7.2.6 Based on the comments above it is expected that ground movements of this type of retaining wall in London Clay should not exceed 5mm in either vertical or lateral directions. This degree of movement equates to possible damage to adjacent buildings in the very slight category as defined by CIRIA report C580. This degree of damage is classed as decorative and would be identified through the condition surveys carried out under the Party Wall Act.

7.3 Basement to extend below the water table

7.3.1 The intrusive ground investigation has shown that the groundwater will be present at between 4.72 and 5.1 m below existing ground level which is likely to be just above the lowest construction level of the be basement when considering the foundations and below slab drainage. Whilst the basement will extend below the water table and potentially impede on the flow of ground water, the basement is the only potential obstruction in the local area with both the neighbouring buildings not having basements and the London Clay has low permeability so the flow of water will be small or negligible. The embedded pile retaining wall will extend significantly below the basement level and will form a cut off from water continuing to flow into the basement during

construction so the effect of removal of any water from the basement will not adversely affect neighbouring buildings. Therefore the potential impact on the flow of ground water can be considered to be negligible.

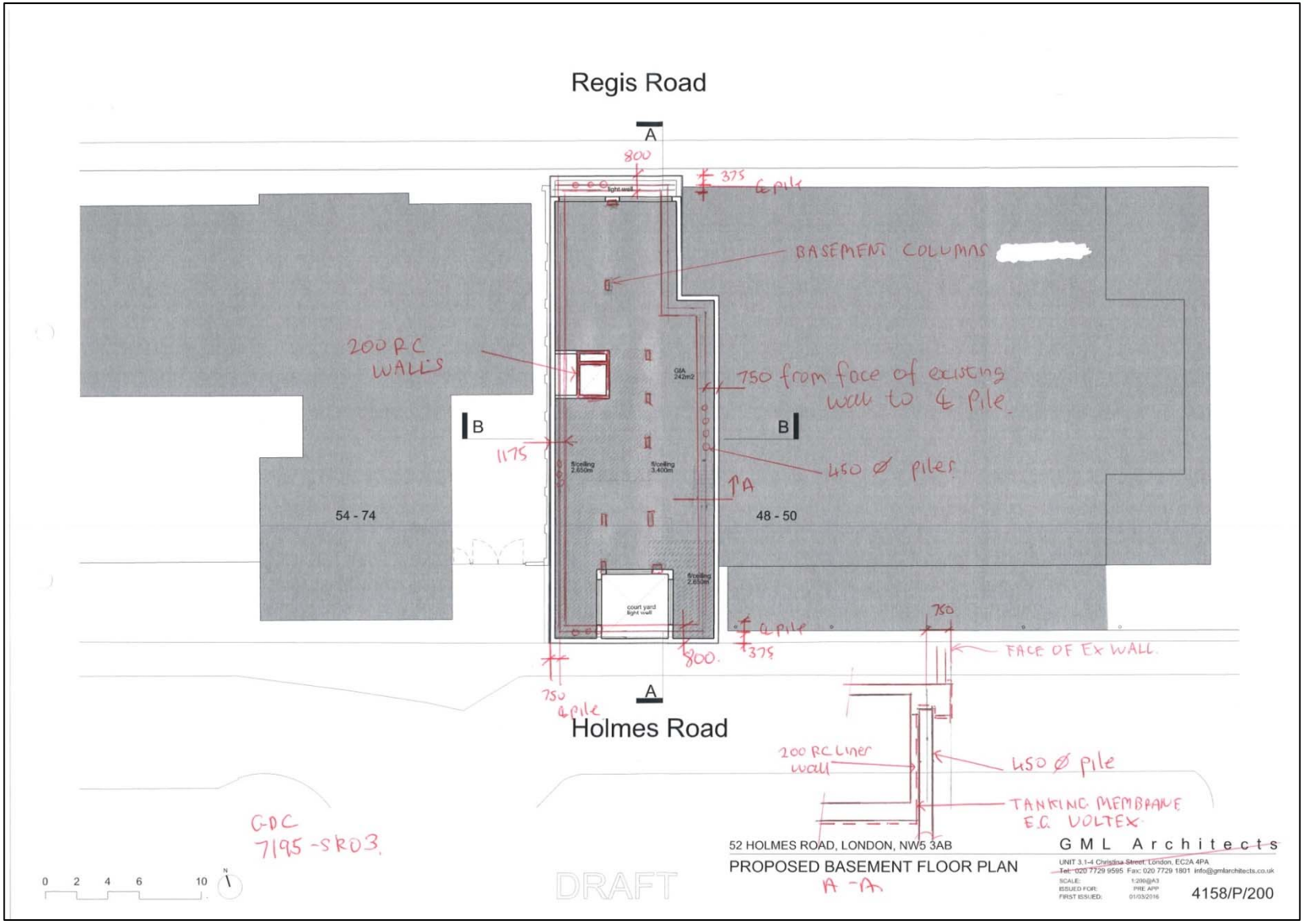
7.3.2 The basement will significantly increase the differential foundation depth in respect of neighbouring buildings the building of concern would be No. 36-52 which is believed to be of a similar construction to No.52 and is therefore likely to have shallow foundations however, the basement will be formed using an embedded piled retaining wall which in the permanent condition will be propped by the ground floor and basement slabs and in the temporary condition by a system of temporary props. Hence the effect on adjacent foundations will be mitigated as the piled retaining wall will be designed to resist any lateral pressures due to adjacent foundations at a higher level and to limit its lateral deflection. No. 54 is a relatively modern building and is believed to have piled foundations.

8.0 Conclusion

8.1 The above Basement Impact Assessment has been carried out in accordance with the guidance produced by London Borough of Camden and specifically Appendix E of 'Guidance For Subterranean Development'. The assessment has followed the four step process of Screening, Scoping, Site Investigation and Impact Assessment. The assessment has reviewed the potential impacts identified by the screening and scoping process and with the results of the site investigation has been able to highlight the mitigating measures that can be put in place to ensure that the basement can be constructed so that it does not unduly impact on the neighbouring buildings or local environment.

APPENDIX A

STRUCTURAL DRAWINGS


Regis Road
A
800
375
℄ pile
BASEMENT COLUMNS
200 RC WALLS
750 from face of existing wall to ℄ Pile
B
B
1175
450 ø piles
GIA 242m2
Strolling 2.650m
Strolling 3.400m
54 - 74
48 - 50
court yard light well
℄ pile
375
800
750
℄ pile
750
FACE OF EX WALL
A
Holmes Road
200 RC Liner wall
450 ø pile
TANKING MEMBRANE E.G. VOLTEX
GDC 7195-SK03
0 2 4 6 10
N
DRAFT
52 HOLMES ROAD, LONDON, NW5 3AB
PROPOSED BASEMENT FLOOR PLAN
A - A
GML Architects
UNIT 3.1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
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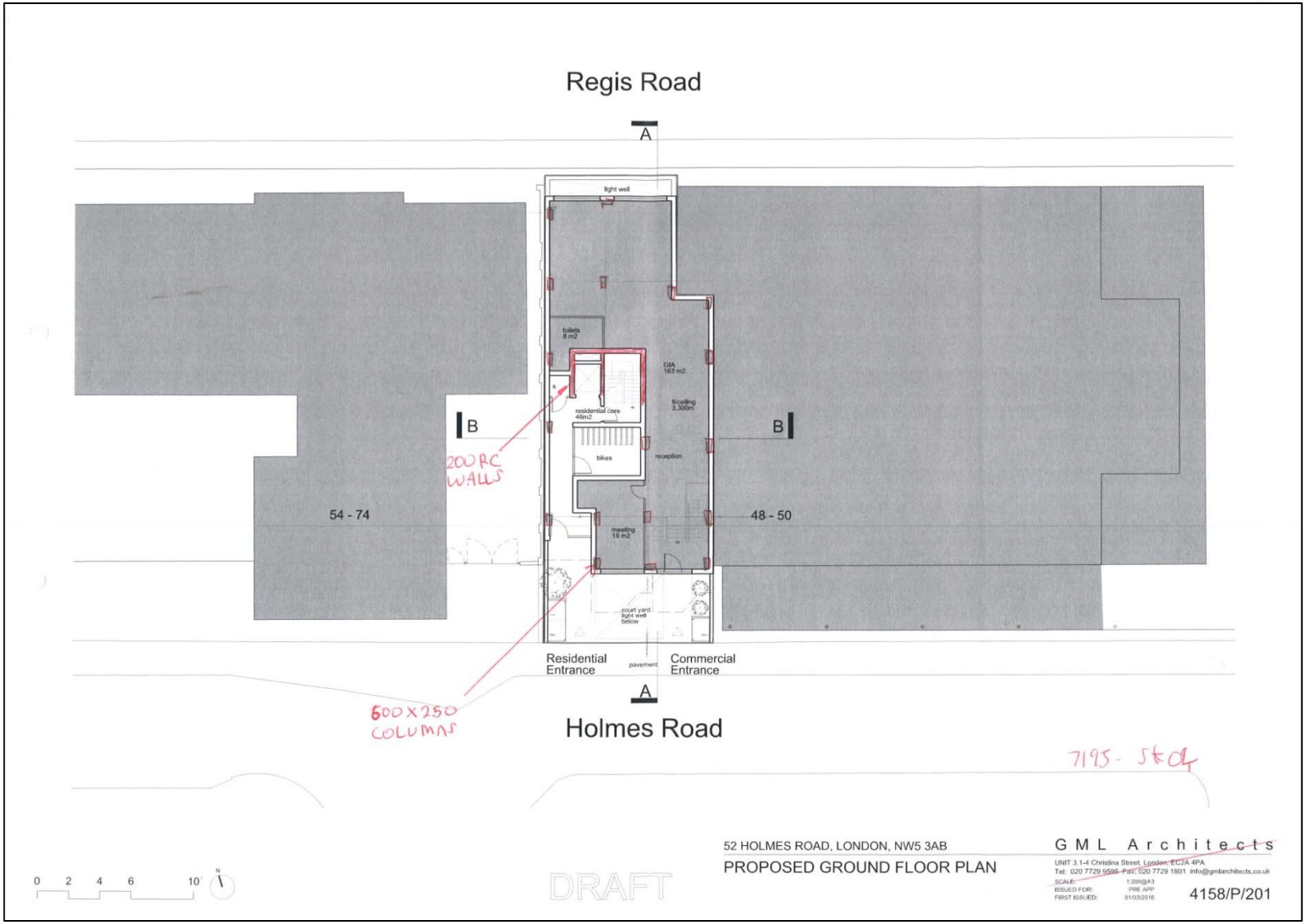
Regis Road
A
light well
toilets
8 m2
GIA
163 m2
residential core
46m2
ffceiling
3.300m
B
B
200 RC
WALLS
bikes
reception
54 - 74
48 - 50
meeting
19 m2
court yard
light well
below
Residential
Entrance
pavement
Commercial
Entrance
A
500 X 250
COLUMNS
Holmes Road
7195 - 5 & 04
0 2 4 6 10
N
DRAFT
52 HOLMES ROAD, LONDON, NW5 3AB
PROPOSED GROUND FLOOR PLAN
G M L A r c h i t e c t s
UNIT 3.1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
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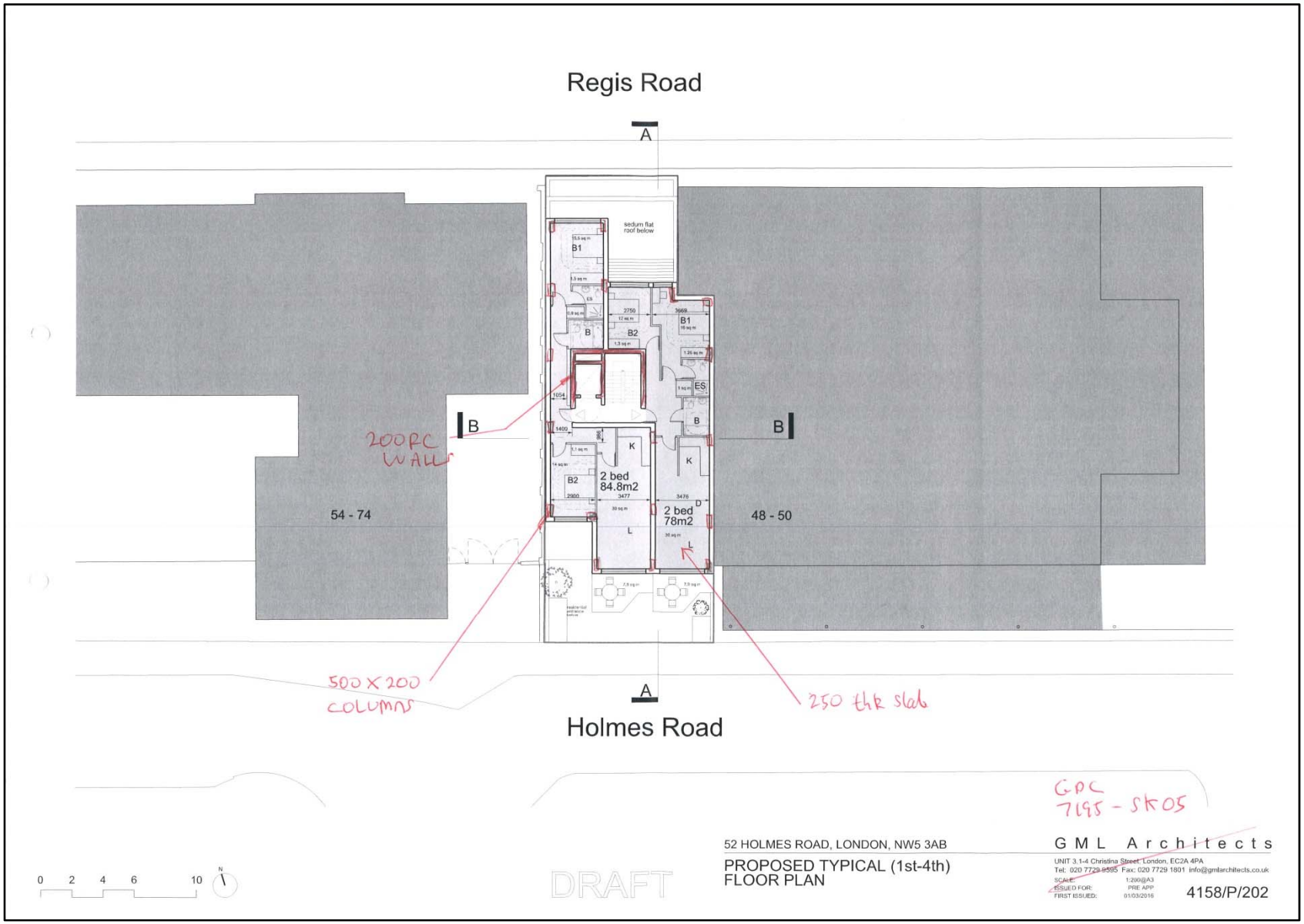
Regis Road
A
B
B
sedum flat roof below
B1
B2
ES
K
L
D
2 bed 84.8m2
2 bed 78m2
54 - 74
48 - 50
200RC WALL
500 X 200 COLUMNS
250 thk slab
A
Holmes Road
0 2 4 6 10
N
DRAFT
52 HOLMES ROAD, LONDON, NW5 3AB
PROPOSED TYPICAL (1st-4th) FLOOR PLAN
GML Architects
UNIT 3.1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 8595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
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APPENDIX B

REPORT ON PHASE 2 GROUND INVESTIGATION

Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 0208 594 8134
Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref:

Ref: 16/25450-1
August 2016

52 HOLMES ROAD,

LONDON, NW5 3AB

REPORT ON A PHASE 2 GROUND INVESTIGATION

Prepared for

G.D.C. Partnership

Working on behalf of

Maison Henry Bertrand (England) ltd

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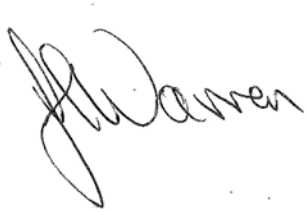
Author: T Murray BSc (Hons) MSc FGS Geotechnical Engineer 
Checked: Jim Warren MRSC. Managing Director 

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1.0 EXECUTIVE SUMMARY

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<tr><td>Site Location</td><td>52 Holmes Road, London, NW5 3AB</td></tr>
<tr><td>Client</td><td>Maison Henry Bertrand (England) Limited</td></tr>
<tr><td>Proposed Development</td><td>At the time of reporting of July 2016, it is proposed to demolish the existing property and construct a new 6 storey (plus basement) mixed use property, comprising 9 self-contained units and industrial employment space within the basement and ground floor.</td></tr>
<tr><td>Environmental Setting</td><td>The site is underlain by the London Clay formation.

The Bedrock geology underlying the site is classified as Unproductive Strata
There is no surface water within 250m of the site.</td></tr>
<tr><td colspan="2">Geotechnical Investigation</td></tr>
<tr><td>Ground Conditions Encountered</td><td>The boreholes and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.00m in thickness underlain by the London Clay Formation.</td></tr>
<tr><td>Groundwater</td><td>Groundwater was encountered at a depth of 5.10m and 4.72m below ground level in Boreholes 1 and 2 respectively after a period of approximately four to five weeks.</td></tr>
<tr><td>Engineering Observations and Recommendations</td><td>Based on the ground and groundwater conditions encountered in the boreholes, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff gravelly clay deposits which occur at a depth of approximately 0.60m below ground level. Foundations should be placed at a minimum depth of 1.00m below final ground level in order to avoid the zone affected by seasonal moisture content changes.</td></tr>
<tr><td colspan="2">Environmental Investigation</td></tr>
<tr><td>Soil Contamination</td><td>The findings of the Phase 2 site investigation have demonstrated that in the context of a proposed mixed residential and commercial use of the site, the contaminants of concern with respect to end-user protection were Asbestos encountered across the whole site plus localised Cyanide, Lead and PAH.</td></tr>
<tr><td>Risk Assessment</td><td>
<table>
<tr><th>Potential Contaminants / Source</th><th>Pathway</th><th>Receptor</th><th>Site specific settings</th><th>Risk Classification: Based on Phase II Investigation</th><th>Action Required</th></tr>
<tr><td>Asbestos & Cyanide, Lead and PAH</td><td>Inhalation, ingestion and dermal contact.</td><td>Human health Site users</td><td>Mixed residential and commercial use</td><td>Low/Medium</td><td>Further action required – Remediation required</td></tr>
</table>
</td></tr>
</table>

	Asbestos & Cyanide, Lead and PAH	Inhalation, ingestion and dermal contact	Human Health Workers	Workers and the general public should follow regulation on health and safety during development (HSE, 1991)	Low	All site works must be carried out according to Health and Safety Executive (HSE) procedures.
	No Sources	Through high permeability strata, fissures and shafts, and by inhalation by humans	Human Health Inhalation of Gases	Nature and depth of any made ground is unknown.	Low	No Further Action
	Cyanide, Lead and PAH	Leaching (direct precipitation, overland flow and through flow)	None	Unproductive Aquifer underlying the site	Low	No Further Action
	Cyanide, Lead and PAH	Negligible groundwater flow	None	Unproductive Aquifer underlying the site	Low	No Further Action
	Cyanide, Lead and PAH	Chemical attack, gas accumulation in buildings	Building structures/services	Made ground underlying the site	Low	WATER UK HBF guide recommendations for potable water pipes..
	Cyanide, Lead and PAH	Uptake (root and stomata), ingestion, inhalation and dermal absorption by animal)	Ecological features (i.e. Flora and Fauna)	No significant Ecological system within 250m of the site.	Low	No Further Action
Recommendations	A full Remediation Strategy may be required at site. A Validation Report will be required after remedial actions are completed in order to validate the remediation undertaken.					

2.0 INTRODUCTION

2.1 Outline and Limitations of Report

At the request of G.D.C Partnership, working on of Maison Henry Bertrand (England) Limited, a ground investigation was carried out in connection with a proposed development at the above site.

The information was required for the design and construction of foundations and infrastructure for the proposed development, which includes demolition of the existing property and construction of a new 6 storey (plus basement) mixed use property, comprising 9 self-contained units and industrial employment space within the basement and ground floor. Information was also required in order to assess whether any remediation was required for the protection of the end-user from the presence of potential contamination within the soils encountered.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.2 Report objectives

This report comprises a Phase 2 - Intrusive Investigation Report to assess potential contamination within the soils and waters encountered and assess potential risks to the end-user of the site from the presence of such contamination.

Planning permission granted by councils for development of Brownfield land often have conditions attached which require the following site investigation to be undertaken and submitted to the local authority for approval:

1. Phase 1 - Preliminary Risk Assessment
2. Phase 2 - Intrusive Investigation
3. Phase 3 - Remediation Strategy
4. Phase 4 - Validation Report

A Phase 1 - Preliminary Risk Assessment has previously been undertaken at the site.

3.0 SITE DETAILS

(National Grid Reference: TQ 288 850)

3.1 Site Location

52 Holmes Road is a commercial property, located on the northern side of Holmes Road, Kentish Town at approximate postcode NW5 3AB. The commercial property has two levels of accommodation; ground and first floor. The commercial property comprises a hardstanding area at the front of the property, which is used for parking. The site covers an approximate area of 0.04 Hectares with the general area being under the authority of the London Borough of Camden.

The site is located on the northern side of Holmes Road with a commercial property to the east, a charity to the west and roadways to the north and south.

3.2 Published Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

3.3 Previous Investigations

A report on a Phase 1 Preliminary Risk Assessment was undertaken at the site by Site Analytical Services Limited (SAS Report Ref: 16/25450 dated August 2016).

3.4 Proposed development

Demolition of existing building and replacement with a new build mixed use development of 6 storeys (plus basement) comprising of 9 self-contained units (8x2 bed and 1x3 bed) on floors 1-5 and 377sq.m of industrial employment space (B1c) on the basement and ground floors.

3.5 References of planning applications

The main planning application for the site Ref: 2016/1986/P was registered on the London Borough of Camden portal in April 2016.

4.0 SCOPE OF WORK

4.1 Site Works

The exploratory investigation included for an inspection of the site and near surface soils in order to:-

- Determine the presence, extent and significance of potential contaminants in the sub-surface strata associated with current and former activities at the site.
- Assess the significance of potential impacts on sensitive receptors at or adjacent to the site.
- Assess the potential environmental liabilities and consequences associated with the site.
- Identify requirements for further works, including the design of any additional investigative/monitoring works and remedial measures if deemed necessary.

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one rotary percussive borehole to a depth of 20.00m below ground level (Borehole 1).
- The drilling of two continuous flight auger boreholes to a depth of 10.00m below ground level (Boreholes 2 and 3). In the event, Borehole 3 was attempted three times, but has to be terminated at approximately 0.70m depth due to concrete obstructions.
- The installation of a groundwater monitoring standpipe to a depth of 5.00m depth in Boreholes 1 and 2, together with one return monitoring visit.
- The excavation by hand of three trial pits, to 1.50m maximum depth to expose existing foundations on-site.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the boreholes and trial pits.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Interpretative reporting on foundation options for the proposed building and infrastructure.
- A study into the possibility of the presence of toxic substances in the soil, together with limited comment on any remediation required.

4.2 Ground Conditions

The locations of the exploratory holes are shown on the site sketch plan, Figure 1.

The boreholes and trial pits revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised Made Ground up to 1.00m in thickness underlain by the London Clay Formation.

These ground conditions are summarised in the following Table A. For detailed information on the ground conditions encountered in the boreholes and trial pits, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Depth to base of strata (mbgl)	Description
Made Ground	0.00	0.60 to 1.00	Surface layer of reinforced concrete over slightly gravelly sand containing brick and concrete rubble.
London Clay Formation	0.60 to 1.00	20.00	Firm then stiff becoming very stiff fissured dark grey blue silty sandy clay containing parting of silty fine sand and occasional gypsum crystals.

Table A. Summary of Ground Conditions in Exploratory Holes

4.3 Groundwater

Groundwater was not encountered in any of the boreholes or trial pits during site works and the material remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and trial pits and hence be detected, particularly within more cohesive soils.

Groundwater was encountered at a depth of 5.10m and 4.72m below ground level in Boreholes 1 and 2 respectively after a period of approximately four to five weeks.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (June to August 2016) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

5.0 IN-SITU AND LABORATORY TESTS

5.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A. SPT 'N' values range between 7 and 55.

The results of the tests are shown on the appropriate borehole records and summary sheets presented in Appendix A.

5.2 Undrained Triaxial Compression Test Results

Quick Undrained Triaxial Compression tests were made on six selected undisturbed 100mm diameter samples taken from Borehole 1, with a hand vane test performed on one sample that was unsuitable for the quick undrained triaxial test. The results show the samples to be of medium and then high to very high strength in accordance with BS 5930 (2015).

The results of the tests are presented on Table 1, contained in Appendix B.

5.3 In-situ Vane Tests

In the essentially cohesive natural soils encountered at the site, in-situ shear vane tests were made at regular depth increments in order to assess the undrained shear strength of the materials. The results indicate that the natural soils are of a generally high strength in accordance with BS 5930 (2015).

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

5.4 Classification Tests

Atterberg Limit tests were conducted on four selected samples taken from the cohesive portion of the natural soils in Boreholes 1 and 2 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

These are fine grained silty clay soils of high plasticity and as such generally have a low permeability and a medium to high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 36% to 42%, with three samples being either at or above the 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

The test results are given in tabular format presented on Table 2, contained in Appendix B.

5.5 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on five natural soil samples selected to give a range of depth are presented Table 3, whilst further analyses on soil samples are given within the contamination test results, both contained in Appendix B. The results presented within Table 3 show the soil samples to have water soluble sulphate contents of up to 2.63g/litre associated with near neutral to slightly acidic pH values. The samples selected for contamination analysis indicate the soils to have soluble sulphate contents of up to 2.0g/litre associated with alkaline pH values.

6.0 CONTAMINATION TESTING

6.1 Site conceptual model

In accordance with current UK guidance on contaminated land risk assessment (CLR7, CLR11 and BS10175), the following Conceptual Site Model has been generated to summarise the primary sources, receptors and migration and exposure pathways present on the site and to aid in the decision making process.

For an environmental risk to exist there has to be a source of contamination, receptor or receptors at risk from the contamination and one or more pathway which links the two. Such contaminant – pathway – receptor relationships are termed pollutant linkages.

The subject site has been assessed within the source – pathway – receptor methodology as described above in the framework of a conceptual site model. A conceptual site model can be defined as a testable representation of environmental processes on a site and its vicinity. Its purpose is to identify potential contaminants, pathways and receptors with a view to, initially identifying potential and eventually, quantifying significant pollutant linkages. It should highlight any limitation and uncertainties present in the risk assessment and be able to communicate the results of the risk assessment to all stakeholders.

A Phase I Desk Study has been undertaken at the site and environmental information has also been researched from the Environmental Agency website, Google maps and other on line sources. The site conceptual model is presented below.

Potential Contaminants / Source	Pathway	Receptor	Site specific settings	Action Required
Made Ground / Unknown History	Inhalation, ingestion and dermal contact.	Human health Site users	Mixed Residential and Commercial use	Further action required – Further Investigation
Made Ground / Unknown History	Inhalation, ingestion and dermal contact	Human Health Workers	Workers and the general public should follow regulation on health and safety during development (HSE, 1991)	Further action required – Further Investigation

Made Ground / Unknown History	Through high permeability strata, fissures and shafts, and by Inhalation by humans	Human Health Inhalation of Gases	Nature and depth of any made ground is unknown.	Further action required – Further Investigation
Made Ground / Unknown History	Leaching (direct precipitation, overland flow and through flow)	None	Unproductive Aquifer underlying the site	No further action required
Made Ground / Unknown History	Negligible groundwater flow	None	Unproductive Aquifer underlying the site	No further action required
Made Ground / Unknown history	Chemical attack, gas accumulation in buildings	Building structures/services	Made ground underlying the site	Further action required – Further Investigation
Made Ground / Unknown History	Uptake (root and stomata), ingestion, inhalation and dermal absorption by animal)	Ecological features (i.e. Flora and Fauna)	No significant Ecological system within 250m of the site.	No further action required

Table B: Phase 1 Conceptual Site Model

6.2 Made Ground encountered

The investigation revealed the presence of Made Ground across the site to depths of between up to 1.00m bgl. The Made Ground in BH3A to 3C and TP1-3 inclusive was encountered to the full depth of investigation at 0.55m – 0.70m.

The Made Ground consisted of a surface layer of chipboard then concrete typically overlying sand with concrete and brick rubble and flint gravel.

Depth of Made Ground	
Trial Hole	**Depth (bgl)**
BH1	1.00m
BH2	0.60m
BH3A	Full Depth – 0.70m
BH3B	Full Depth – 0.70m
BH3C	Full Depth – 0.62m
TP1	Full Depth – 0.65m
TP2	Full Depth – 0.55m
TP3	Full Depth – 0.70m

Table C: Depth of Made Ground

6.3 Sampling Strategy

The strategy for selecting the locations of the exploratory positions was based on the conceptual source, pathway and receptor model and potentially contaminating activities identified by the Conceptual Site Model.

A non-targeted sampling strategy is appropriate when there is:
- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:
- Adequate information available regarding the likely locations of contamination;
- Sensitive areas where there is a need for a high degree of confidence.

No adequate information was available regarding likely locations, so a non-targeted sampling pattern was adopted at the site, designed to provide coverage across the site as a whole. Non-targeted sampling depths were chosen to reflect the receptors of concern including future users of the site, visitors to the site, construction workers on-site, service and maintenance workers, site neighbours and wider public, construction materials, groundwater and surface water and typically comprised a near surface samples within the Made Ground. Samples were analysed from this depth range below ground level as it is felt that these soils will be representative of those of highest end-user exposure through the dermal contact, dust inhalation and soil ingestion pathways.

A total of six sampling locations have been excavated at the site providing a density equivalent to a circa 15m grid.

Site Area/Activity	**Exploratory Hole Location(s)**	**Surface**
General site coverage where Made Ground of unknown origin is expected. Non-targeted sampling	BH1, BH2, BH3C TP1, TP2, TP3	Made Ground

Table D: Site Conceptual Model

6.4 Determination of Contaminants of Concern

Samples for a full contamination analysis were obtained from 0.25m in BH1, BH3A and TP2, from 0.40m in TP3 and from 0.50m in BH2, made at the locations indicated on the site sketch plan (Figure 1).

The samples were submitted for a broad screen of total potential contaminants, including those potential contaminants of concern on-site and included pH, Sulphate, Sulphide, Cyanide, Phenols, Metals & Semi-Metals: Cd, Cr, Pb, Hg, Ni, Se, Cu, Zn, V, B, As, Asbestos Screening and Quantification, Organics: USEPA 16 speciated Polycyclic Aromatic Hydrocarbons, Aromatic /Aliphatic Carbon Banded Petroleum Hydrocarbons, BTEX and MTBE Compounds and Soil Organic Matter (SOM).

The samples selected for contamination assessment were sub-contracted to i2 Analytical Limited (a UKAS and MCERTS accredited laboratory) and their report is contained in Appendix B.

6.5 Qualitative Risk Assessment

The hazard caused by the presence of a substance or element is not absolute but depends on the proposed end use of the site.

It is understood that the site is to be developed for mixed commercial and residential use without areas of private garden. As such the S4UL screening levels for residential use without home-grown produce and Category 4 Screening Level for residential use have been used in the following soil assessment.

Site data has been assessed against current generic assessment criteria (GAC) / guideline values in accordance with current industry practice and statutory guidance; chemical toxicology (TOX), Soil Guideline Value (SGV) reports developed using the new Contaminated Land Exposure Assessment (CLEAv1.06) framework, CLR 11 (Environment Agency, 2009) and SP1010: Development of Category 4 screening levels for assessment of land affected by contamination (DEFRA, 2014).

However, it must be remembered that GAC are not binding standards but can be useful in forming judgements regarding the level of risk i.e. unacceptable or acceptable. Exceedance of GAC does not automatically result in the requirement for remedial / risk management work but would warrant further assessment.

6.6 Suitable 4 Use Levels, Category 4 Screening Levels, Soil Guideline Values, CLR Documents & Chartered Institute of Environmental Health Values

Under Part 2A of the Environmental Protection Act 1990, land is determined as contaminated if it is deemed to be causing significant harm, or where there is a Significant Possibility of Significant Harm to human health.

From January 2009 revised Soil Guidance Values for certain contaminants were issued in the Contaminated Land Reports (CLR) by the Environment Agency in conjunction with Department of the Environment, Food, Agriculture and Rural Affairs. These values and the CLEA methodology used to derive them have superseded CLEA and TOX reports for soil contaminants.

The CLR Documents are a series of contaminated land guidance documents developed by various past and present government agencies involved with protection of the environment.

These documents aim to provide a set of generic Soil Guideline Values and a site specific modelling programme based upon tolerable predicted uptakes from experimental data for a variety of common industrial toxic contaminants. In instances of carcinogenic and mutanagenic substances the guideline values are set on the basis of "As Low As Reasonably Practicable" (ALARP), as theoretically mutation can occur on exposure to a single particle of the contaminant.

Revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990 was published in April 2012, which introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health, where Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low.

'Category 4 Screening Levels' (C4SLs) have been introduced in March 2014 to provide a simple test for deciding when land is suitable for use and definitely not contaminated land. The Category 4 Screening Levels consist of estimates of contaminant concentrations in soil that are considered to present an 'acceptable' level of risk, within the context of Part 2A.

In response, in November 2014, The Chartered Institute of Environmental Health Generic Assessment Criteria for Human Health Risk Assessment adopt the Environment Agency's CLEA UK (Beta) Model and Category 4 Screening Levels and as such have derived guideline values that are compatible with current English legislation, policy and technical guidance in the form of LQM/CIEH S4ULS's (Suitable 4 Use Levels).

The methodology for deriving both the previous Soil Guideline Values and the new Suitable 4 Use Levels is based on the Environment Agency's Contaminated Land Exposure Assessment (CLEA) methodology.

At the time of writing this report Suitable 4 Use Levels are in place for some heavy metals, BTEX Substances, Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons as well as a number of selected organic compounds.

Generic Assessment Criteria for Human Health Risk Assessment (S4UL's) have been produced by LQM / Chartered Institute of Environmental Health for a residential use without home grown produce. These are Arsenic 40mg/kg, Beryllium 1.7mg/kg, Boron 11000mg/kg, Cadmium 85mg/kg, Trivalent Chromium (Chromium III) 910mg/kg, Hexavalent Chromium (Chromium VI) 6mg/kg, Copper 7100mg/kg, Mercury (Elemental) 1.2mg/kg, Mercury (Inorganic) 56mg/kg, Methylmercury 11mg/kg, Nickel 180mg/kg, Selenium 430mg/kg, Vanadium 1200mg/kg, Zinc 40000mg/kg, Benzene (2.5% SOM) 0.7mg/kg, Toluene (2.5% SOM) 1900mg/kg, Ethylbenzene (2.5% SOM) 190mg/kg, Xylenes (2.5% SOM) from 180mg/kg and Phenols (2.5% SOM) 1300mg/kg.

As no generic UK derived guidance is currently available for acceptable concentrations of Total Lead, the Category 4 Screening Level for residential use without home-grown produce of 310mg/kg has been used to identify where potential risks may exist.

The Environment Agency has released the CLEA software and its handbook to help assessors estimate risks. The Chartered Institute of Environmental Health Generic Assessment Criteria for Human Health Risk Assessment (S4UL's) adopt the Environment Agency's CLEA UK (Beta) Model and as such have derived guideline values that are compatible out current English legislation, policy and technical guidance.

Assessment criteria (S4UL's) for selected individual Polycyclic Aromatic Hydrocarbons have been produced by Chartered Institute of Environmental Health; however no values have been attached to Total Polycyclic Aromatic Hydrocarbons. Sixteen individual Polycyclic Aromatic Hydrocarbons with attached screening values include Benzo(a)anthracene 11-15mg/kg, Benzo(a)pyrene 3.2mg/kg, Dibenzo(a,h)anthracene 0.31- 0.32mg/kg and Naphthalene 2.3-13mg/kg for a residential scenario without home grown produce.

The concentrations of Total Petroleum Hydrocarbons have been assessed against assessment criteria (S4UL's) for individual Aromatic and Aliphatic carbon band ranges produced by Chartered Institute of Environmental Health for a residential scenario without home grown produce.

As no generic UK derived guidance is currently available for acceptable concentrations of Total Cyanide a screening value of 20mg/kg (Thiocyanate) has been used as a preliminary screening tool to identify where potential risks may exist.

As described in Using Soil Guideline Values – Environment Agency 2009, chemical data from the analysis of samples generated during the intrusive investigation have been used to create a data set for the site. The entire data set, as opposed to individual results has been analysed on the assumption that the samples from the site investigation are to some degree representative of the contaminant concentration throughout the area or volume of soil investigated. The most appropriate method for assessing a given dataset is dependent upon a range of specific factors together with the quantity and quality of the data generated.

In accordance with the recommendations provided within Guidance on comparing soil contamination data with a critical concentration – CIEH/CL:AIRE, 2008, we have selected the one sample t-test at a 95% confidence level as the most appropriate statistical tool for generating site representative soil concentration values and have assumed that the data is normally distributed. We have assumed that this statistical test is required to draw conclusions about the condition of the land under scrutiny as part of a planning scenario as opposed to the Part 2A scenario. Under a planning scenario, comparison is made between a value larger than the sample mean, in this case the Upper Confidence Limit and the critical concentration.

In instances where the Upper Confidence Limit exceeded the given critical value, then the Grubbs Test has been used to identify upper outliers to assess whether the highest value belongs to the general population of the dataset or is representative of an outlier.

6.7 Discussion

6.7.1 Human health risk assessment (On-site users, Workforce and Neighbouring residents)

Concentrations of the zootoxic heavy metals Total Arsenic, Total Boron, Total Cadmium, Hexavalent Chromium, Trivalent Chromium, Total Mercury, Total Selenium, Total Copper, Total Nickel and Total Zinc in the samples analysed did not exceed the S4UL Generic Guideline Values for a residential scenario without home-grown produce. As such there is not considered to be any potentially significant level of end-user risk associated with the concentrations of these contaminants encountered.

The concentration of Total Lead encountered in the BH2 location was in excess of the Category 4 Screening Level for residential use without home-grown produce of 310mg/kg at 450mg/kg. It was therefore decided to undertake statistical analysis of the data set, using the arithmetic mean and standard deviation for Lead. An outlier test identified the particularly elevated concentration of Lead in BH2 as not representative of the rest of the sample population and indicative of a locally affected area or "hot-spot" of contamination and the soil should be treated accordingly.

The concentration of Total Cyanide in TP2 at 0.25m was above the screening value of 20mg/kg at 62mg/kg. There is no current Guideline Value for residential end use, however a potential risk may exist depending on the final site development.

The concentrations of Total Phenol were below the S4UL Generic Guideline Value for a residential scenario without plant uptake.

Elevated concentrations of Polycyclic Aromatic Hydrocarbons including Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(a,h)anthracene were encountered in the sample from 0.25m depth in Trial Pit 2 in excess of the respective S4UL Generic Guideline Values for a residential scenario without home-grown produce at 1% SOM content. As such the potential risks to the end users of the site cannot be discounted at this stage.

The concentrations of Petroleum Hydrocarbons encountered within individual Aromatic and Aliphatic carbon band ranges in the samples analysed did not exceed the S4UL Generic Guideline Values for a residential scenario without home-grown produce. As such there is not considered to be any potentially significant level of end-user risk associated with the concentrations of these contaminants encountered.

The concentrations of Benzene Toluene, Ethylbenzene and Xylenes encountered did not exceed the S4UL Screening Levels for residential use without home grown produce. As such there is not considered to be any potentially significant level of end-user risk associated with the concentrations of these contaminants encountered.

There was no MTBE detected within the samples analysed.

6.7.2 Asbestos Containing Materials

The Made Ground at each exploratory location was screened for the presence of asbestos containing material. In all cases asbestos containing material was identified during the laboratory analysis. The material found comprised of loose fibres, or lagging or hard cement material. Samples from BH1, BH3A, TP2 and TP3 contained between 0.002% and 0.005% Chrysotile asbestos. The sample from BH2 contained 0.016% asbestos, which was a mixture of Chrysotile, Amosite and Crocidolite asbestos.

The risks associated with the asbestos containing material would be deemed low should they remain in-situ beneath the building floor slab. Any activities that would result in the asbestos containing material being disturbed, such as construction work, would be considered as a potential high risk and should be taken into consideration for future development be proposed for the site.

6.7.3 Landscape Planting / Ecological features

The concentrations of the phytotoxic substances Total Copper, Total Zinc and Total Nickel encountered in the samples obtained were generally below the landscape planting generic assessment levels.

6.7.4 Buildings and Construction Materials

Concrete Cast In-Situ

The range of concentrations of water soluble sulphate within the Made Ground at the site were within BRE (2005) Design Class DS-3 for concrete cast in-situ. This should be taken into account should any concrete structures be installed within the soils represented by these samples.

Potable Water Supply Pipes

If at any point in the future it be intended to install new water supply pipes within the Made Ground then consideration to the pipe materials used and/or the trench construction in accordance with UKWIR (2010). Based upon the analysis undertaken, the concentrations of TPH returned by samples of Made Ground may preclude the use of standard PE pipe materials at the site.

6.7.5 Shallow and deep groundwater/ Surface Water risk

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain the London Clay Formation at depth.

The site is not located within a source protection zone.

It is unlikely that the proposed development, including the installation of foundations or piles, would impact the quality of the water environment.

6.7.6 Soil Disposal

All samples were analysed using the 'Catwastesoil' assessment tool, which concluded that the samples taken from the site were not hazardous in nature.

The concentrations of asbestos within the samples analysed indicate that the material is non-hazardous, however on the basis that asbestos was identified in all samples analysed it should be assumed that pockets of greater concentration might be encountered that could result in a Hazardous classification.

6.7 Revised site conceptual model and Conclusions

The findings of the Phase 2 site investigation have demonstrated that in the context of a proposed mixed residential and commercial use of the site, the contaminants of concern with respect to end-user protection were Asbestos and Lead, Cyanide and of Polycyclic Aromatic Hydrocarbons including Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(a,h)anthracene.

A Phase 2 Site Investigation has identified the following Source/Pathway/receptor linkages present on-site or potentially present.

Potential Contaminants / Source	Pathway	Receptor	Site specific settings	Risk Classification: Based on Phase II Investigation	Action Required
Asbestos & Cyanide, Lead, PAH	Inhalation, ingestion and dermal contact.	Human health Site users	Mixed residential and commercial use	Low	Further action required – Remediation required
Asbestos & Cyanide, Lead, PAH	Inhalation, ingestion and dermal contact	Human Health Workers	Workers and the general public should follow regulation on health and safety during development (HSE, 1991)	Low	All site works must be carried out according to Health and Safety Executive (HSE) procedures.
No Source	Through high permeability strata, fissures and shafts, and by inhalation by humans	Human Health Inhalation of Gases	Small amount of made ground on site.	No Risk	No Further Action
Cyanide, Lead, PAH	Leaching (direct precipitation, overland flow and through flow)	None	Unproductive Aquifer underlying the site	No Risk	No Further Action
Cyanide, Lead, PAH	Negligible groundwater flow	None	Unproductive Aquifer underlying the site	No Risk	No Further Action
Sulphates /TPH	Chemical attack, gas accumulation in buildings	Building structures/services	Made ground underlying the site	Low	WATER UK HBF guide recommendations for potable water pipes.

Cyanide, Lead, PAH	Uptake (root and stomata), ingestion, inhalation and dermal absorption by animal)	Ecological features (i.e. Flora and Fauna)	No significant Ecological system within 250m of the site.	No Risk	No Further Action

Table E: Phase 2 Conceptual Site Model

6.8 Viable Risks requiring action

- There is a risk to end-users of the site from the concentration of Asbestos encountered on-site. Remediation should be undertaken on-site to negate these risks.

- There is a risk to end-users of the site from hotspots of Total Cyanide, Lead and PAH encountered on-site. Remediation should be undertaken on-site to negate these risks.

- There is a risk to the workforce on-site from the concentrations of Asbestos, Cyanide, Lead and PAH encountered on-site. Appropriate PPE and following health and safety regulations would negate this risk.

6.9 Remedial options proposed

A number of potential remedial options are presented to sever the pollutant linkages present and include:

Option 1: Excavation of Impacted Soil

On the basis that the proposed development is the construction of a basement, then excavation and removal of the impact soils is the most likely solution to be adopted. Once excavation has been completed validation would be required to prove all impacted soil has been removed. Validation would involve taking a representative number of samples from the sides and base of any excavation and then sent off for appropriate chemical analysis. The stockpiled soils must be placed on an impermeable liner with raised edges. During periods of rainfall, the stockpile must be covered over to minimise leaching and run-off into the underlying soils. Covering of the stockpile may be required to prevent dust impacting receptors off-site. Damping down of the stockpile is advised to further reduce the risk associated with dust generation.

The remedial works must be inspected and independently validated by a suitable person. On completion of the development, a Validation and Closure Report must be supplied to both the Local Authority detailing the remediation works undertaken on the site. Any voids resulting from the removal of impacted soil that are not part of the basement excavation must be backfilled with a suitable certified clean granular soil.

The developer/groundworker must be made aware of the potential for sources not identified in the Phase 2 site investigation to be found within the site both during demolition and the excavation of trenches for services and foundations.

Option 2: Hard Landscape Entire Site

Maintaining a hard cover across the entire site could eliminate exposure to contaminated soils through:

I. Direct soil and dust ingestion,
II. Dermal contact
III. Inhalation of dust (indoor and outdoor).

It is understood that no soft landscaping is present on site and none is proposed.

The risk management framework set out in the Model Procedures for the Management of Land Contamination, CLR 11, is applicable to the redevelopment of sites that may be affected by contamination.

The risk management process set out in the Model Procedures has three main components:

- Risk assessment
- Options appraisal
- Implementation

This initial risk assessment has identified a number of relevant pollutant linkages, as demonstrated in the updated conceptual model.

A Phase 3 Remediation Strategy is required to assess remedial options and propose a viable strategy on-site.

The remediation strategy will need to review methods of reducing or controlling the identified unacceptable risks. This could be done by removing or treating the sources of contamination, removing or modifying the pathways or removing or modifying the behaviour of the receptors, to ensure there is no significant risk of significant harm to either human health or controlled waters from the identified contamination, in relation to the proposed end use.

An important part of the risk management process is identifying and informing all stakeholders with an interest in the outcome of the risk management project. To this end, if the regulators have not yet been contacted with regard to the redevelopment of this site, it is recommended that they be supplied with a copy of both the Preliminary Investigation reports and this Phase 2 Ground Investigation report in order to enable liaison to be undertaken with them.

Following liaison with the relevant regulatory bodies, a Phase 3 Remediation Strategy could be formulated, which should incorporate an options appraisal and summarise in detail the chosen remedial approach, along with the verification proposals. The remediation strategy should then be approved by the relevant regulatory authorities prior to implementation.

Where remediation is required, a Phase 4 Verification Report will need to be formulated following implementation of the remediation strategy, which should provide a complete record of all remedial activities conducted on site and include all the data obtained to support the remedial objectives and demonstrate that the remediation has been effective. Any unexpected conditions encountered during the remedial works should also be detailed within the verification report.

6.10 Discovery Strategy

The discovery strategy sets out the actions that must be taken if contamination is encountered during the course of a development.

A significant observation includes any observation of contamination. Examples of the types of observations that would be considered significant are set out in the following table.

Evidence	Description
Visual	• Fuel or oil like substances mixed in with or smeared on the soil or floating on perched, groundwater or surface waters. • Waste materials (refuse, barrels, industrial wastes, ash, tar, etc.) buried at specific location or across the site. • Marked variation in colour. For example red, orange, yellow, green, light or dark blue, etc. may indicate contamination from a variety of contaminants. • Soils including large amounts of ash and clinker where such contamination of soils wasn't expected.
Odours	• Fuel, oil and chemical type odours • Unusual odours such as sweet odours or fishy odours
Wellbeing	• Light headedness and/or nausea when in excavations, at the working face of an excavation, when visual or olfactory evidence of contamination exists, etc. • Burning of nasal passages, throat, lungs or skin • Blistering or reddening of skin due to contact with soil

Table F: Potential indicators of contamination

Note: The examples provided in this table are not exhaustive.

The following table sets out the actions that must be taken if significant or suspected land, water or air contamination is observed by site staff, contractors or visitors.

Person observing contamination	To be reported to:	Action to be taken
Site visitor	Must report observations to the site manager	None
Contractor	Must report observations to the site manager	Stop work and where possible and safe make area safe and secure area before reporting to site manager
On-site manager	Must report observations to their direct manager, the appointed Environmental Consultant, the Planning Authority and Contaminated Land Officer at the London Borough of Camden	Stop work and where possible and safe make area safe and secure area before reporting to others
Environmental Consultant	Must report observations to the site manager, the Planning Authority and Contaminated Land Officer at the London Borough of Camden	Advise that work stops and where possible that the area is made safe before reporting to others

Table G: Actions after observation

The following table identifies other organisations that may need to be contacted in an emergency or where pollution of controlled waters or nuisance is occurring.

Occurrence	Description	Contact
Risk to the public	If at any point residents, the public or others may be at risk as a result of contamination found during the course of investigation, remediation or development works	• Contact the emergency services if there is a risk to life • Contaminated Land Officer/Planning Authority • Health & Safety Executive
Nuisance to residents / the public	If a nuisance has been or is likely to be caused to nearby residents, the public and others – for example odours, dust, noise, vibration, etc.	• Pollution Control Team at the Local Council (and other Councils where necessary)
Pollution of controlled waters	If any surface, culverted or groundwater has been polluted – for example slurry, contaminated soil/water or a chemical spillage entering a river or canal.	• Environment Agency • Planning Authority and Contaminated Land Officer at the Local Council
Pollution of adjoining land	If land outside the boundary of the development site is polluted from site activities – for example slurry, contaminated soil/water or a chemical spillage	• The owner of the land • Planning Authority and Contaminated Land Officer at the Local Council

Table H: Actions after observation

Any materials brought onto the site (soils and / or clay) should be validated either at source or once laid at site. Given the nature of the ground conditions, appropriate health and safety practices should be adhered to in order to protect site workers. Any waste material leaving site for off-site disposal (soil and / or water) should be handled in accordance with the current Waste Management and Duty of Care Regulations.

The above conclusions have been drawn on the results of the tests carried out on the soil samples analysed and address remediation issues for the protection of the end-user only. It is recommended that any remedial measures suggested in this report should be subject to formal approval by local Environmental Health and/or Planning Departments and approval should be obtained prior to any works being undertaken. The comments made in this report do not address any third party liability.

7.0 FOUNDATION DESIGN

7.1 General

At the time of reporting of August 2016, it is proposed to demolish the existing property and construct a new 6 storey (plus basement) mixed use property, comprising 9 self-contained units and industrial employment space within the basement and ground floor. Details of the structures, layouts etc. have been provided, although details of the loadings were not available at the time of preparation of this report.

7.2 Site Preparation Works

The main contractor should be informed of the site conditions and risk assessments should be undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man-made services are undertaken over the site prior to final design works.

7.3 Conventional Spread Foundations

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the boreholes, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff gravelly clay deposits which occur at a depth of approximately 0.60m below ground level. Foundations should be placed at a minimum depth of 1.00m below final ground level in order to avoid the zone affected by seasonal moisture content changes.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 100kN/m^2 at 3.00m depth and 165kN/m^2 at 5.00m depth in order to allow for a factor of safety of 2.5 against general shear failure. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from “Foundation Design and Construction”, Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, “Building near Trees" and it is considered that this document is relevant in this situation.

7.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

7.5 Retaining Walls

7.5.1 General

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table I below to assist the design of these structures.

Stratum	Depth to top (m)	Bulk Density (Mg/m3) (ɣ)	Effective Angle of Internal Friction (Φ)
London Clay Formation	0.60	2.00	22

Table I: Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients ka and kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

7.6 Excavations

Shallow excavations for foundations and services are likely to require nominal side support in the short term and groundwater is unlikely to be encountered in significant quantities once any accumulated surface water has been removed. Deeper and longer excavations below approximately 1.50m below existing ground level will require close side support and some seepages of groundwater could be encountered.

No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps.

Normal safety precautions should be taken if excavations are to be entered.

7.7 Chemical Attack on Buried Concrete

The results presented in Appendix B show the soil samples tested to have water soluble sulphate contents of up to 2.63/litre associated with near neutral to slightly acidic pH values. The samples of Made Ground tested indicated water soluble sulphate contents of up to 2.0g/litre associated with alkaline pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-3 conditions.

7.8 List of Appendices

Figure 1 – Site Sketch Plan

Appendix A – Borehole / Trial Pit Logs

Appendix B – Laboratory Test Data

8.0 REFERENCES

1. Beckett M.J. and Sims D.L. (1984). "The Development of Contaminated Land", Symposium on Hazardous Waste Disposal and the Re-use of Contaminated Land. Society of Chemical Industry.

2. British Standards Institution, 2001. Investigation of Potentially Contaminated Sites - Code of Practice, BS 10175, BSI, London

3. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

4. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London

5. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London

6. British Standards Institution, 20. Code of Practice for Site Investigations, BS5930:1999+A2: 2010, BSI, London

7. British Standards Institute: BS 10175 'Code of practice for the investigation of potentially contaminated sites', BSI 2011.

8. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London

9. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."

10. Building Research Establishment, Report 414, 'Protective Measures for Housing on Gas Contaminated Land', 2004.

11. Building Research Establishment Digest 465, 'Cover Systems for Land Regeneration – Thickness Cover Systems for Contaminated Land', 2004.

12. CatWasteSoil, www.catwastesoil.com

13. CIEH/CL:AIRE, 2008. Guidance on comparing soil contamination data with a critical concentration. London: Chartered Institute of Environmental Health.

14. CIRIA Reports 149 to 152, 'Methane and Associated Hazards to Construction', 1995.

15. CIRIA C665, 'Assessing Risks Posed by Hazardous Ground Gases in Buildings', 2007.

16. DEFRA, 2006b. Environmental Protection Act 1990: Part 2A. Contaminated Land. Defra Circular 01/2006. London: Department for Environment, Food and Rural Affairs.

17. DEFRA, 2008a. Improvements to contaminated land guidance. Outcome of the “Way Forward” exercise on soil guideline values. Defra: Department for Environment, Food and Rural Affairs.

18. DEFRA, 2008b. Guidance on the legal definition of contaminated land. London: Department for Environment, Food and Rural Affairs.

19. DEFRA, 2015. Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010

20. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

21. Environment Agency, 2000a. Secondary model procedure for the development of appropriate soil sampling strategies for land contamination. R&D Technical Report P5-066/TR. Bristol: Environment Agency.

22. Environment Agency, 2000b. Technical aspects of site investigation, Volumes 1 and 2. R&D Technical Report P5-065/TR. Bristol: Environment Agency.

23. Environment Agency, 2002, CLR 8, ‘Potential contaminants for the assessment of contaminated land’. DEFRA/EA.

24. Environment Agency, 2004 CLR 11, ‘Model Procedures for the Management of Contaminated Land’, DEFRA and Environment Agency,

25. Environment Agency, 2005. Sampling and testing of wastes to meet landfill Waste Acceptance Criteria. Bristol: Environment Agency

26. Environment Agency, 2009a. Updated technical background to the CLEA model. Science Report SC050021/SR3. Bristol: Environment Agency.

27. Environment Agency, 2009b. Human health toxicological assessment of contaminants in soil. Science Report Final SC050021/SR2. Bristol: Environment.

28. Environment Agency, 2009c. CLEA software version 1.06. Bristol: Environment Agency.

29. Environment Agency, 2009d. CLEA software (version 1.06) handbook. Science Report SC050021/SR4. Bristol: Environment Agency.

30. Environment Agency 2015. Waste Classification: Guidance on the classification and assessment of waste (1st edition 2015)

31. Environment Agency, 2009e. CLR 4, ‘Sampling strategies for contaminated land’. Report by The Centre for Research into the Built Environment, the Nottingham Trent University, DoE, 1994.

32. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London

33. Nathanail, C.P.; McCaffrey,C.; Gillett, A.G.; Ogden, R.C. & Nathanail, J.F., 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

34. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

35. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

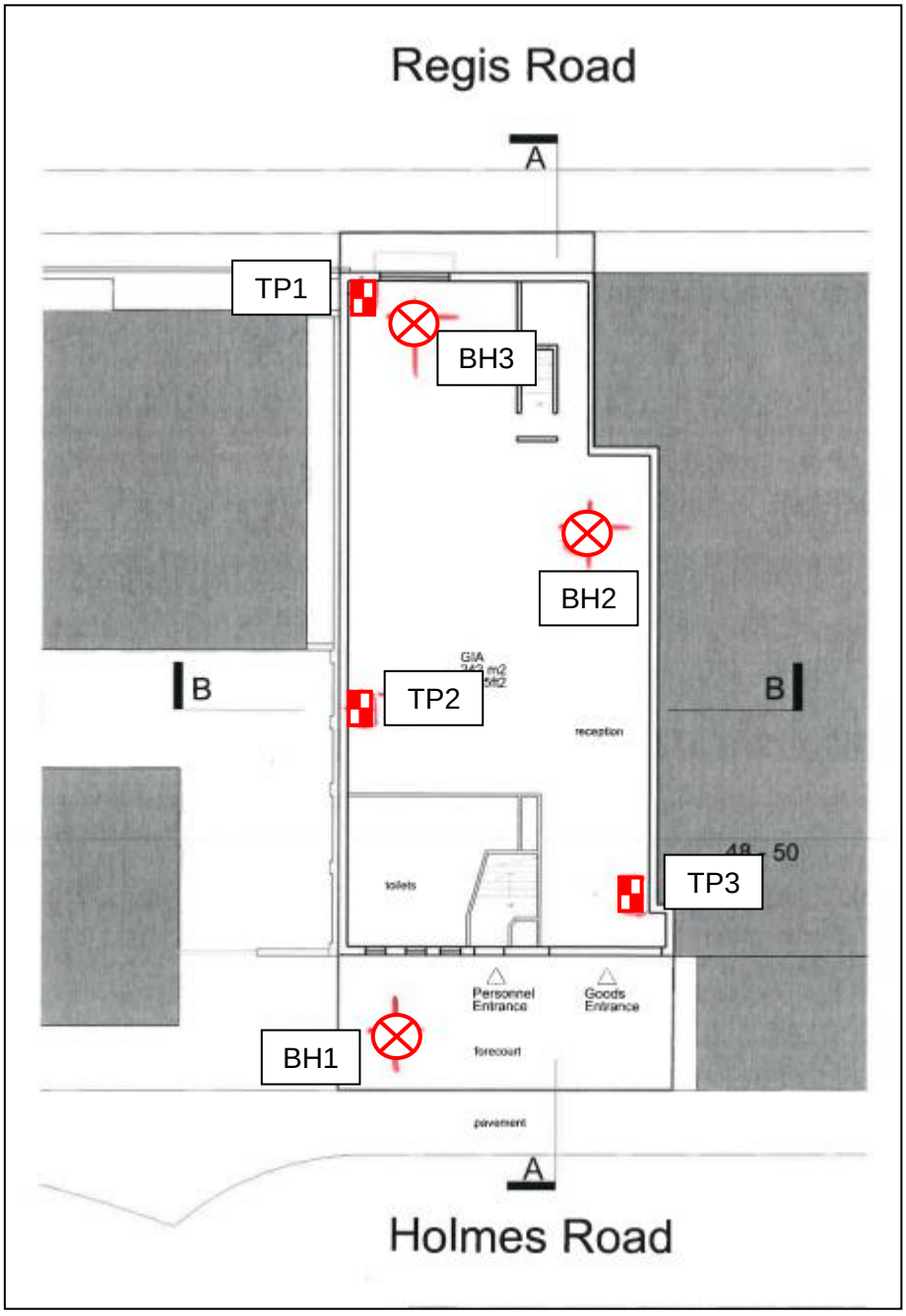
36. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

37. Water Supply (Water Quality) Regulations 2000, Statutory Instrument 2000 No. 3184, Crown Copyright 2000.

38. UK Water Industry Research Limited, ‘Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites’, report reference Number 10/WM/03/21, 2010.

39. Water Regulations Advisory Scheme, Information and Guidance Note, October 2002, ‘The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land’.

Site Analytical Services Ltd.				REF: 16/25450
LOCATION:	52 Holmes Road, London, NW5 3AB			FIG: 1
TITLE:	Site Sketch Plan	DATE:	August 2016	SCALE: NTS



A P P E N D I X `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location TQ288850	**Dates** 30/06/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20)	MADE GROUND: Reinforced concrete		
						0.20			
0.25	D1					(0.20)	MADE GROUND: Slightly gravelly sand with fragments of brick and concrete rubble. Gravel is fine to coarse of sub-angular to sub-rounded flint		
0.50	D2					0.40			
0.75	D3					(0.30)	MADE GROUND: Yellow brown slightly gravelly sand with fragments of brick and concrete rubble. Gravel is fine to medium of sub-angular to sub-rounded flint		
1.00-1.45	SPT(C) N=7		DRY	1,1/1,2,2,2		0.70			
1.00	D4					(0.30)	MADE GROUND: Soft,mottled brown slightly gravelly silty clay with fragments of brick and concrete rubble. Gravel is fine of sub-angular to sub-rounded flint		
						1.00			
1.75	D5						Firm becoming stiff, mottled brown sandy silty CLAY		
2.00	D6								
2.00-2.45	U1 40								
2.75	D7								
3.00-3.45	SPT N=11		DRY	1,1/2,3,3,3					
3.00	D8								
3.75	D9								
4.00	D10								
4.00-4.45	U2 70								
4.75	D11								
5.00-5.45	SPT N=18		DRY	3,3/4,4,5,5					
5.00	D12					(8.30)			
6.00	D13								
6.50	D14								
6.50-6.95	U3 115								
7.50	D15								
8.00-8.45	SPT N=29		DRY	6,6/7,7,7,8					
8.00	D16								
9.00	D17								
						9.30			
9.50	D18						Very stiff, blue sandy silty CLAY with occasional gypsum crystals		
9.50-9.95	U4 130					(0.70)			

Remarks
D= Distrubed Sample
U= Undisturbed 100mm Diameter Sample
C= Dynamic Penetration Test - Cone
S= Standard Penetration Test - Cone
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	EW

Figure No. 1625450.BH1

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location	**Dates**	**Engineer**	**Sheet**
	TQ288850	30/06/2016	G.D.C PARTNERSHIP	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						10.00	Very stiff, blue sandy silty CLAY with occasional gypsum crystals		
10.50	D19								
11.00-11.45	SPT N=42		DRY	8,9/10,10,11,11					
11.00	D20								
12.00	D21								
12.50	D22								
12.50-12.95	U5 140								
13.50	D23								
14.00-14.45	SPT N=45		DRY	10,10/11,11,11,12					
14.00	D24								
15.00	D25					(10.00)			
15.50	D26								
15.50-15.95	U6 140								
16.50	D27								
17.00-17.45	SPT N=48		DRY	10,11/12,12,12,12					
17.00	D28								
18.00	D29								
18.50	D30								
18.50-18.95	U7 150								
19.25	D31								
19.55-20.00	SPT N=55		DRY	12,12/13,14,14,14					
19.55	D32								
						20.00			

Remarks
D= Distrubed Sample
U= Undisturbed 100mm Diameter Sample
C= Dynamic Penetration Test - Cone
S= Standard Penetration Test - Cone
Groundwater was not encountered during boring/excavation

Scale (approx)	Logged By
1:50	EW

Figure No. 1625450.BH1

Site Analytical Services Ltd.

Standard Penetration Test Results

Site : 52 HOLMES ROAD,LONDON,NW5 3AB

Client : MAISON HENRY BERTRAND (ENGLAND) LTD

Engineer : G.D.C PARTNERSHIP

Job Number 1625450

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.00	1.15	1.45	CPT	1	1	1	2	2	2	N=7	
BH1	3.00	3.15	3.45	SPT	1	1	2	3	3	3	N=11	
BH1	5.00	5.15	5.45	SPT	3	3	4	4	5	5	N=18	
BH1	8.00	8.15	8.45	SPT	6	6	7	7	7	8	N=29	
BH1	11.00	11.15	11.45	SPT	8	9	10	10	11	11	N=42	
BH1	14.00	14.15	14.45	SPT	10	10	11	11	11	12	N=45	
BH1	17.00	17.15	17.45	SPT	10	11	12	12	12	12	N=48	
BH1	19.55	19.70	20.00	SPT	12	12	13	14	14	14	N=55	

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH1

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 128 mm

Client
MAISON HENRY BERTRAND (ENGLAND) LTD

Job Number
1625450

Location
TQ288850

Ground Level (mOD)

Engineer
G.D.C PARTNERSHIP

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				1.00	Bentonite Seal
					Slotted Standpipe
				5.00	
				6.00	Bentonite Seal
					General Backfill
				20.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks
Lockable cover set in cement

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location TQ288850	**Dates** 30/06/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.07	
						(0.20)	MADE GROUND: Wooden chipboard.
0.25	D1					0.27	
						(0.33)	MADE GROUND: Reinforced concrete.
0.50	D2					0.60	MADE GROUND: Red brick fragments and crush.
0.75	D3						Stiff brown silty sandy CLAY containing partings of silty fine sand and occasional gyspum crystals.
1.00	D4						
1.00	V1 117						
1.50	D5						
1.50	V2 130+						
2.00	D6						
2.00	V3 130+						
2.50	D7						
2.50	V4 130+						
3.00	D8						
3.00	V5 130+						
3.50	D9						
3.50	V6 130+						
4.00	D10						
4.00	V7 130+						
4.50	D11						
4.50	V8 130+						
5.00	D12						
5.00	V9 130+					(9.40)	
6.00	D13						
6.00	V10 130+						
7.00	D14						
7.00	V11 130+						
8.00	D15						
8.00	V12 130+						
9.00	D16						
9.00	V13 130+						
10.00	D17			30/06/2016:DRY			
10.00	V14 130+					10.00	

Remarks
D = Disturbed sample
V = Vane Test - Results in kPa
Groundwater was not encountered during drilling.
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	TM

Figure No. 1625450.BH2

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH2

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
MAISON HENRY BERTRAND (ENGLAND) LTD

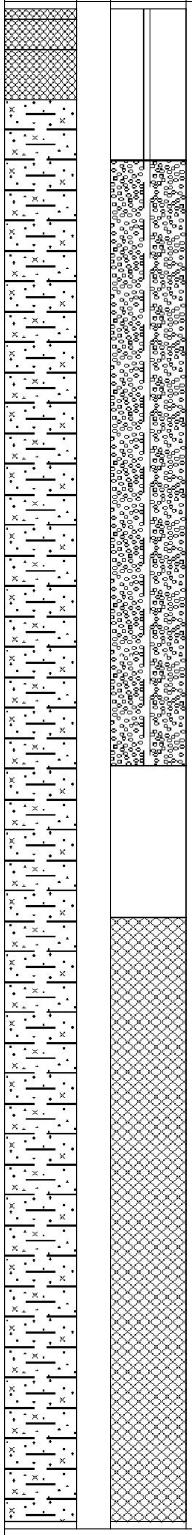
Job Number
1625450

Location
TQ288850

Ground Level (mOD)

Engineer
G.D.C PARTNERSHIP

Sheet
1/1



Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				1.00	Bentonite Seal
				5.00	Slotted Standpipe
				6.00	Bentonite Seal
				10.00	General Backfill

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
30/06/16				DRY			10.00		DRY	

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

Remarks
Lockable cover set in concrete.

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH3A

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location TQ288850	**Dates** 01/07/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.04	MADE GROUND: Wooden Chipboard.		
						(0.15)			
						0.19	MADE GROUND: Reinforced concrete.		
0.25	D1						MADE GROUND: Brown gravelly sand containing brick and concrete fragments.		
						(0.51)			
0.50	D2								
0.70	D3			01/07/2016:DRY		0.70	Complete at 0.70m		

Remarks
D = Disturbed sample
Groundwater was not encountered during drilling.
Borehole was terminated at 0.70m due to a concrete obstruction.
Excavating from 0.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:25	TM

Figure No. 1625450.BH3A

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH3B

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location	**Dates**	**Engineer**	**Sheet**
	TQ288850	01/07/2016	G.D.C PARTNERSHIP	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.04	MADE GROUND: Wooden Chipboard.		
						(0.15)			
						0.19	MADE GROUND: Reinforced concrete.		
0.25	D1						MADE GROUND: Brown gravelly sand containing brick and concrete fragments.		
						(0.46)			
0.50	D2								
						0.65			
0.70	D3			01/07/2016:DRY		0.70	MADE GROUND: Pea Gravel		
							Complete at 0.70m		

Remarks
D = Disturbed sample
Groundwater was not encountered during drilling.
Borehole was terminated at 0.70m due to a concrete obstruction (Drain pipe).
Excavating from 0.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:25	TM

Figure No.
1625450.BH3B

Site Analytical Services Ltd.

Site	Borehole Number
52 HOLMES ROAD,LONDON,NW5 3AB	BH3C

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location	**Dates**	**Engineer**	**Sheet**
	TQ288850	01/07/2016	G.D.C PARTNERSHIP	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.04	MADE GROUND: Wooden Chipboard.		
						(0.15)			
						0.19	MADE GROUND: Reinforced concrete.		
0.25	D1						MADE GROUND: Brown gravelly sand containing brick and concrete fragments.		
						(0.43)			
0.50	D2								
0.62	D3					0.62	Complete at 0.62m		

Remarks
D = Disturbed sample
Groundwater was not encountered during drilling.
Borehole was terminated at 0.70m due to a concrete obstruction.
Excavating from 0.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:25	TM

Figure No. 1625450.BH3C

Site Analytical Services Ltd.

Site	Trial Pit Number
52 HOLMES ROAD,LONDON,NW5 3AB	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m(W) x 0.30m(L) x 0.65m(D)		MAISON HENRY BERTRAND (ENGLAND) LTD	1625450
	Location TQ288850	**Dates** 30/06/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.04	MADE GROUND: Wooden floor.		
					(0.18)	MADE GROUND: Reinforced concrete over a DPM.		
0.25	D1				0.22	MADE GROUND: Brown silty sand containing brick and concrete fragments.		
0.50	D2				(0.43)			
					0.65	Complete at 0.65m		

Plan

Remarks

D = Disturbed sample
Pit terminated at 0.65m depth due to a concrete obstruction.
Groundwater was not encountered during excavation.

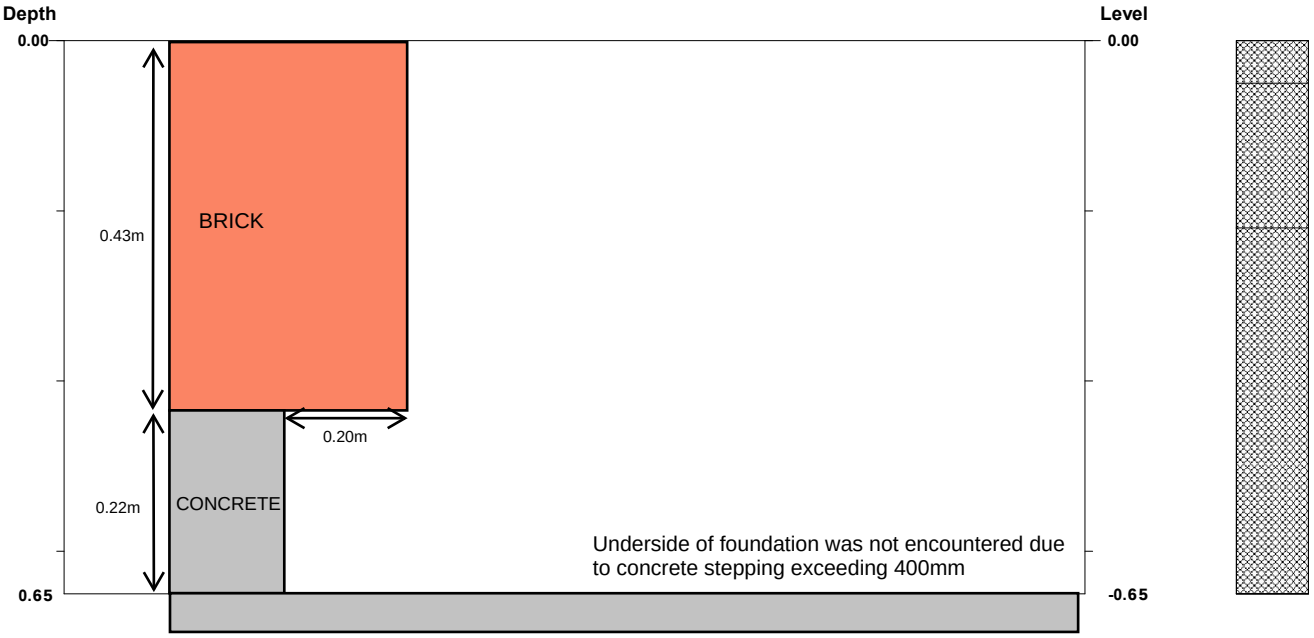
Scale (approx)	Logged By	Figure No.
1:25	TM	1625450.TP1

Site Analytical Services Ltd.

Site	Trial Pit Number
52 HOLMES ROAD,LONDON,NW5 3AB	TP1

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.65m(D)		MAISON HENRY BERTRAND (ENGLAND) LTD	1625379

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ339907	01/07/2016	G.D.C PARTNERSHIP	1/1



Strata

Depth (m)	No.	Description
0.00-0.05	1	MADE GROUND: Wooden floor
0.05-0.22	2	MADE GROUND: Reinforced concrete over damp proof membrane
0.22-0.65	3	MADE GROUND: Dark brown black clayey sand with fragments of brick and concrete rubble and ash

Samples and Tests

Depth (m)	Type	Field Records
0.25	D1	
0.50	D2	
0.65	D3	

Excavation Method:
HAND EXCAVATION

Shoring / Support:
GOOD

Stability:
N/A

Backfill:
ARISINGS

Remarks
D= Disturbed Sample
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 0.65m for 1 hour.

Logged By : EW
Checked By :
Figure No. : 1625379.TP1

Site Analytical Services Ltd.

Site 52 HOLMES ROAD,LONDON,NW5 3AB			**Trial Pit Number** TP2
Excavation Method HNA DEXCAVATION	**Dimensions** 0.30m(W) x 0.30m(L) x 0.55m(D)	**Ground Level (mOD)**	**Client** MAISON HENRY BERTRAND (ENGLAND) LTD	**Job Number** 1625450
	Location TQ288850	**Dates** 30/06/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.04	MADE GROUND: Wooden Chipboard.		
					0.08	MADE GROUND: Reinforced concrete.		
0.25	D1				(0.47)	MADE GROUND: Silty sand containing brick and concrete fragments.		
0.50	D2		30/06/2016:DRY		0.55	Complete at 0.55m		

Plan

Remarks

D = Disturbed sample
Groundwater was not encountered during excavation.
Trial Pit terminated at 0.55m due to a concrete obstruction.

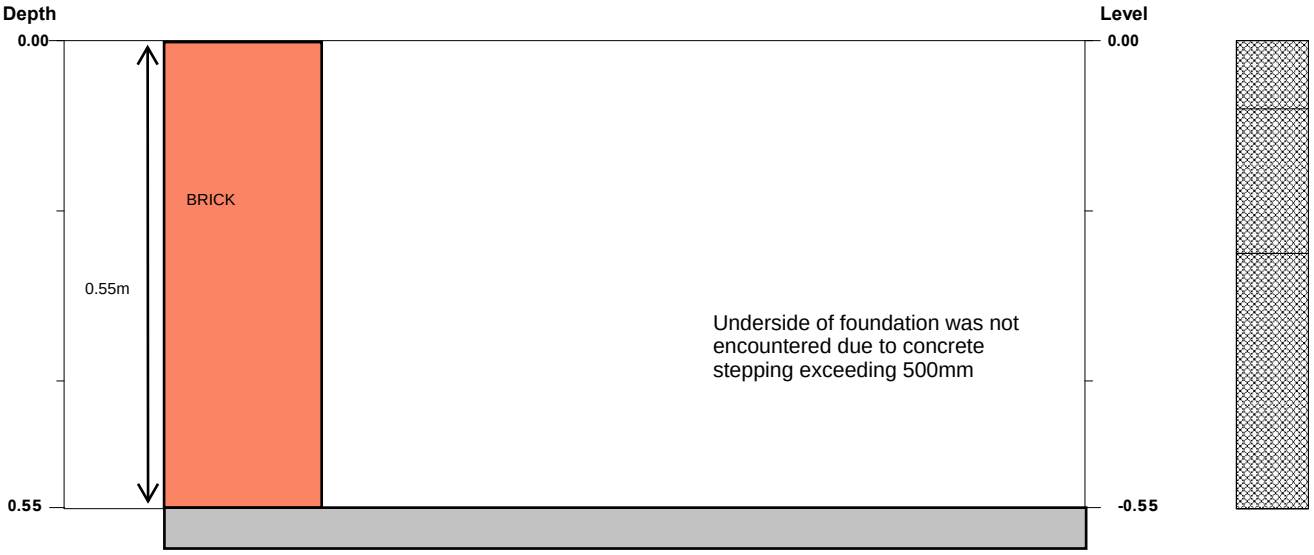
Scale (approx)	Logged By	Figure No.
1:25	TM	1625450.TP2

Site Analytical Services Ltd.

Site	Trial Pit Number
52 HOLMES ROAD,LONDON,NW5 3AB	TP2

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.55m(D)		MAISON HENRY BERTRAND (ENGLAND) LTD	1625379

Orientation	Location	Dates	Engineer	Sheet
A D B C	TQ339907	01/07/2016	G.D.C PARTNERSHIP	1/1



Strata

Depth (m)	No.	Description
0.00-0.08	1	MADE GROUND: Wooden floor
0.08-0.25	2	MADE GROUND: Reinforced concrete over damp proof membrane
0.25-0.55	3	MADE GROUND: Brown yellow sand with fragments of brick and concrete rubble

Samples and Tests

Depth (m)	Type	Field Records
0.25	D1	
0.55	D2	

Excavation Method:
HAND EXCAVATION

Shoring / Support:
GOOD

Stability:
N/A

Backfill:
ARISINGS

Remarks
D= Disturbed Sample
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 0.55m for 1 hour.

Logged By : EW
Checked By :
Figure No. : 1625379.TP2

Site Analytical Services Ltd.

Site 52 HOLMES ROAD,LONDON,NW5 3AB			**Trial Pit Number** TP3
Excavation Method HNA DEXCAVATION	**Dimensions** 0.30m(W) x 0.30m(L) x 0.70m(D)	**Ground Level (mOD)**	**Client** MAISON HENRY BERTRAND (ENGLAND) LTD	**Job Number** 1625450
	Location TQ288850	**Dates** 30/06/2016	**Engineer** G.D.C PARTNERSHIP	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.04	MADE GROUND: Wooden Chipboard.		
					0.08			
					(0.17)	VOID		
0.25	D1				0.25	MADE GROUND: Reinforced concrete.		
0.40 0.40-0.70	D2 M1 80/300				(0.45)	MADE GROUND: Silty sand containing brick and concrete fragments.		
			30/06/2016:DRY		0.70	Complete at 0.70m		

Plan

Remarks

D = Disturbed sample
Groundwater was not encountered during excavation.

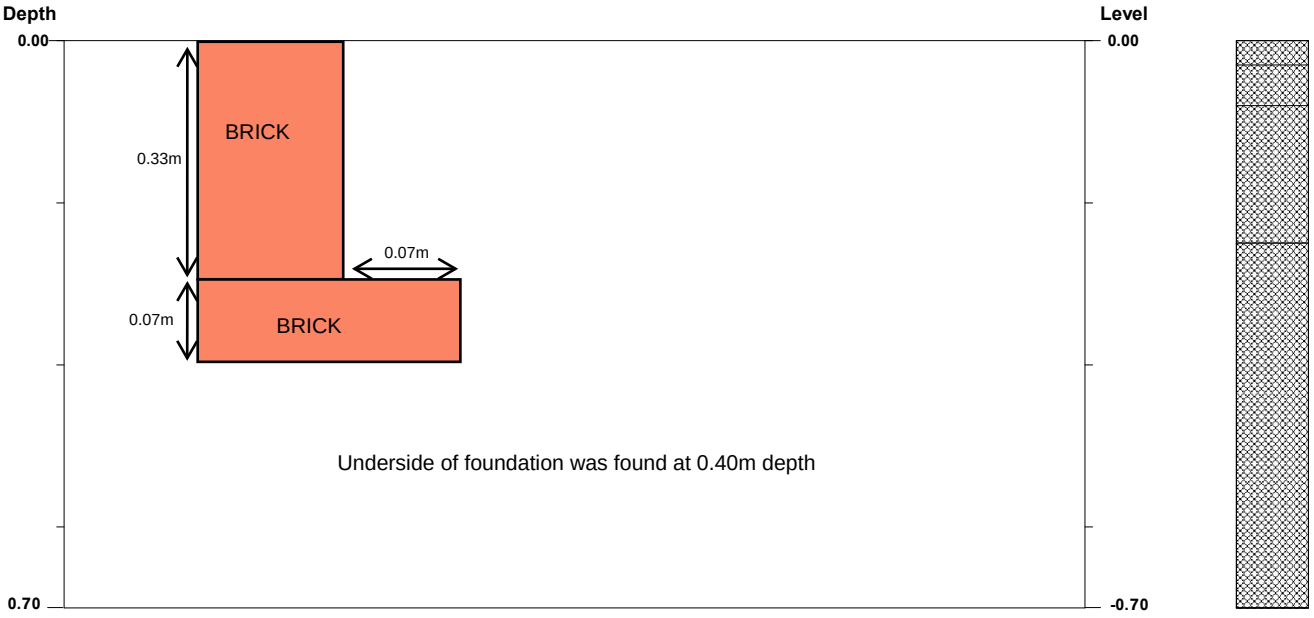
Scale (approx)	Logged By	Figure No.
1:25	TM	1625450.TP3

Site Analytical Services Ltd.

Site	Trial Pit Number
52 HOLMES ROAD,LONDON,NW5 3AB	TP3

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	0.30m(W) x 0.30m(L) x 0.65m(D)		MAISON HENRY BERTRAND (ENGLAND) LTD	1625379

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C	TQ339907	01/07/2016	G.D.C PARTNERSHIP	1/1



Strata

Depth (m)	No.	Description
0.00-0.03	1	MADE GROUND: Wooden floor
0.03-0.08	2	MADE GROUND: Void
0.08-0.25	3	MADE GROUND: Double reinforced concrete
0.25-0.70	4	MADE GROUND: Very loose, brown slightly clayey silty sand with red brick and crush

Samples and Tests

Depth (m)	Type	Field Records
0.25	D1	
0.40 0.40-0.70	D2 M1 80/300	

Excavation Method:
HAND EXCAVATION

Shoring / Support:
GOOD

Stability:
N/A

Backfill:
ARISINGS

Remarks
D= Disturbed Sample
M= makintosh Probe - Blows/Penetration (mm)
Groundwater was not encountered during boring/excavation
Excavating from 0.00m to 0.70m for 1 hour.

Logged By	: EW
Checked By	:
Figure No.	: 1625379.TP3

A P P E N D I X `B'

Laboratory Test Data

Site Analytical Services Ltd.

Ref: 16/25450-1

UNDRAINED TRIAXIAL COMPRESSION TEST

LOCATION 52 Holmes Road, London, NW5 3AB

BH/TP No.	MOISTURE CONTENT %	BULK DENSITY Mg/m^3	LATERAL PRESSURE kN/m^2	COMPRESSIVE STRENGTH kN/m^2	COHESION kN/m^2	ANGLE OF SHEARING RESISTANCE degrees	DEPTH m
BH1	32	1.90	50	137	69		2.25
	28	1.95	80	161	80		4.25
	27	1.98	130	222	111		6.75
	24	1.94	190	349	175		9.75
	27	2.04	250	391	196		12.75
	28	2.00	310	397	198		15.75

Table 1

Site Analytical Services Ltd.

Ref: 16/25450-1

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 52 Holmes Road, London, NW5 3AB

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 μm %	Class
BH1	3.00	32	65	23	42	100	CH
	3.75	28	67	27	40	100	CH
BH2	3.50	25	59	23	36	100	CH
	4.00	27	66	25	41	100	CH

Table 2

Site Analytical Services Ltd.

Ref: 16/25450-1

SULPHATE & pH DETERMINATIONS

LOCATION 52 Holmes Road, London, NW5 3AB

BH/TP No.	DEPTH BELOW GL m	SOIL SULPHATES AS SO_4 TOTAL %	SOIL SULPHATES AS SO_4 WATER SOL g/l	WATER SULPHATES AS SO_4 g/l	pH	CLASS	SOIL - 2mm %
BH1	5.00		1.75		5.5	DS-3	100
	11.00		0.90		6.1	DS-2	100
	16.50		0.57		6.2	DS-2	100
BH2	3.00		2.63		6.0	DS-3	100
	9.00		1.18		6.0	DS-2	100

Classification – Tables C1 and C2 : BRE Special Digest 1 : 2005

Table 3

Aubrey Davidson
Site Analytical Services Ltd
Units 14 -15
River Road Business Park
33 River Road
Barking
Essex
IG11 0EA

t: 0208 5948134
f: 0208 5948072
e: aubreyd@siteanalytical.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 16-22356

Project / Site name:	52 Holmes Road, London, NW5 3AB	**Samples received on:**	11/07/2016
Your job number:	16-25450	**Samples instructed on:**	11/07/2016
Your order number:	22896	**Analysis completed by:**	18/07/2016
Report Issue Number:	1	**Report issued on:**	18/07/2016
Samples Analysed:	1 bulk sample - 5 soil samples		

Signed:

Dr Irma Doyle
Senior Account Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB
Your Order No: 22896

Lab Sample Number				599768	599769	599770	599771	599772
Sample Reference				BH1	BH2	BH3A	TP2	TP3
Sample Number				D1	D2	D1	D1	D2
Depth (m)				0.25	0.50	0.25	0.25	0.40
Date Sampled				11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	8.2	12	8.1	10	20
Total mass of sample received	kg	0.001	NONE	0.62	0.57	0.57	0.52	0.34
Whole Sample Crushed		N/A	NONE	Crushed	Crushed	Crushed	Crushed	Crushed
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	Chrysotile & Amosite & Crocidolite	Chrysotile	Chrysotile	Chrysotile
Asbestos in Soil Screen	Type	N/A	ISO 17025	Detected	Detected	Detected	Detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.002	0.016	0.002	0.005	0.003
Asbestos Quantification Total	%	0.001	ISO 17025	0.002	0.016	0.002	0.005	0.003
General Inorganics								
pH	pH Units	N/A	MCERTS	10.9	9.8	10.8	10.0	9.1
Total Cyanide	mg/kg	1	MCERTS	< 1	4	1	62	< 1
Complex Cyanide	mg/kg	1	MCERTS	< 1	4	1	61	< 1
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	4300	21000	8000	8900	2400
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.65	2.0	1.1	1.9	0.90
Sulphide	mg/kg	1	MCERTS	1.1	5.4	1.1	1.4	< 1.0
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.2	< 0.1	< 0.1	0.4	0.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.22	1.2	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.59	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.38	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.59	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	0.23	0.81	8.2	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.22	1.8	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	0.52	1.1	13	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	0.43	0.93	11	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	0.26	0.72	6.0	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.29	0.72	5.7	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.54	5.7	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.56	4.4	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	0.23	0.66	6.0	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.28	3.4	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.50	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.36	4.4	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	1.96	7.12	72.6	< 1.60

Analytical Report Number: 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB
Your Order No: 22896

Lab Sample Number				599768	599769	599770	599771	599772
Sample Reference				BH1	BH2	BH3A	TP2	TP3
Sample Number				D1	D2	D1	D1	D2
Depth (m)				0.25	0.50	0.25	0.25	0.40
Date Sampled				11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	10	14	23	10
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.72	0.99	0.66	1.1	1.1
Boron (total)	mg/kg	1	MCERTS	12	21	13	20	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.4	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	27	26	26	49
Copper (aqua regia extractable)	mg/kg	1	MCERTS	19	19	28	64	20
Lead (aqua regia extractable)	mg/kg	1	MCERTS	66	450	95	170	71
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.5	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	18	15	29	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.4	1.1
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	38	40	35	52	84
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	66	150	170	200	86
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2.5	< 2.0	< 2.0	4.2	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	8.1	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	39	13	13	22	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	48	14	16	35	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	2.4	2.6	1.8
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	4.1	12	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	20	130	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	110	30	64	260	11
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	120	36	91	400	22

Analytical Report Number: 16-22356
Project / Site name: 52 Holmes Road, London, NW5 3AB
Your Order No: 22896

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

"The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
599768	BH1	0.25	154	Loose Fibres & Hard/Cement Type Material	**Chrysotile**	0.002	**0.002**
599769	BH2	0.50	156	Loose Fibres & Insulation Lagging & Hard/Cement Type Material	**Chrysotile & Amosite & Crocidolite**	0.016	**0.016**
599770	BH3A	0.25	103	Hard/Cement Type Material	**Chrysotile**	0.002	**0.002**
599771	TP2	0.25	126	Loose Fibres & Hard/Cement Type Material	**Chrysotile**	0.005	**0.005**
599772	TP3	0.40	114	Loose Fibres & Insulation Lagging	**Chrysotile**	0.003	**0.003**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditatior

Analytical Report Number: 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB

Lab Sample Number				602191				
Sample Reference				BH3A				
Sample Number				D1				
Depth (m)				0.25				
Date Sampled				11/07/2016				
Time Taken				None Supplied				
Analytical Parameter (Bulk Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Asbestos Identification Name	Type	N/A	ISO 17025	Chrysotile-Hard/Cement Type Material				

Analytical Report Number : 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
599768	BH1	D1	0.25	Brown sandy clay with rubble.
599769	BH2	D2	0.50	Light brown clay and sand with rubble.
599770	BH3A	D1	0.25	Light brown sandy loam with rubble.
599771	TP2	D1	0.25	Grey sandy loam with gravel and stones.
599772	TP3	D2	0.40	Brown clay.

Analytical Report Number : 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	W	ISO 17025
Asbestos Quantification - Gravimetric	The analysis was carried out using documented in-house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Complex Cyanide in soil	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-UK	D	NONE
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS

Analytical Report Number : 16-22356

Project / Site name: 52 Holmes Road, London, NW5 3AB

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

A P P E N D I X `C'

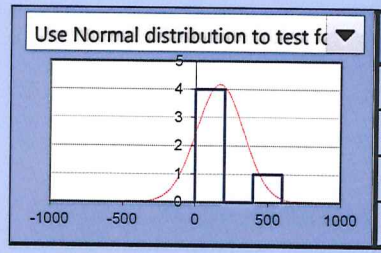
Statistical Analysis

Test Results

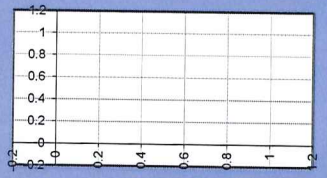
Client/client ref: 52 Holmes Roac Site ref:
Project ref: 16/25450 Data description:

Date: 17-Aug-2016
User details: A Davidson

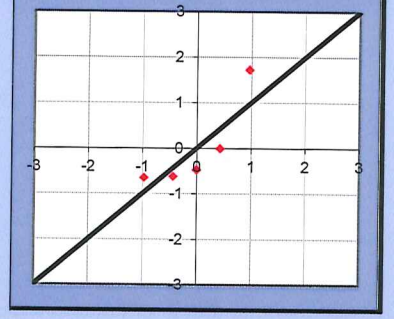
Dataset:	Pb
Sample mean, $\overline{x}$	170.4
Sample standard deviation, s	161.74
Sample size, n	5
Critical concentration, Cc	310



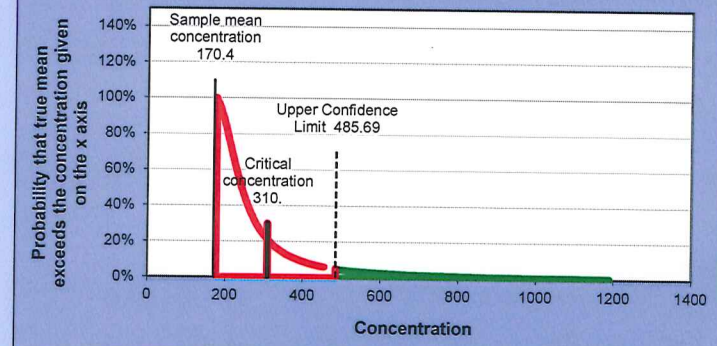
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	79%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	No

Not enough evidence

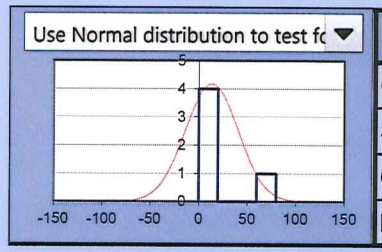
Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

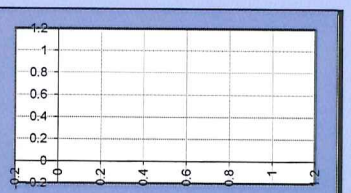
Client/client ref: 52 Holmes Roac Site ref:
Project ref: 16/25450 Data description:

Date: 17-Aug-2016
User details: A Davidson

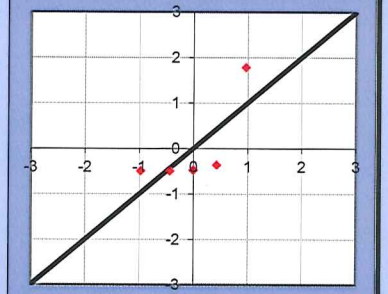
Dataset:	CN
Sample mean, $\overline{x}$	13.6
Sample standard deviation, s	27.096
Sample size, n	5
Critical concentration, Cc	20



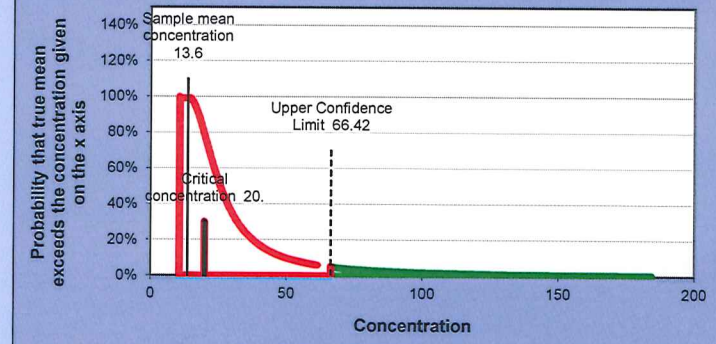
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	2



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	22%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	No
μ ≥ Cc	

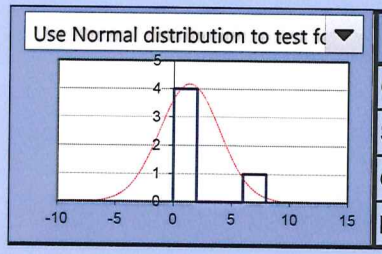
Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

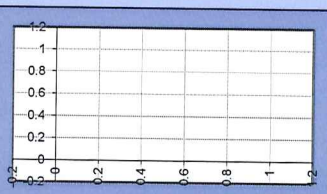
Client/client ref: 52 Holmes Roac Site ref:
Project ref: 16/25450 Data description:

Date: 17-Aug-2016
User details: A Davidson

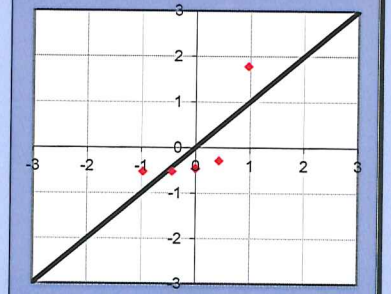
Dataset:	BaP
Sample mean, $\overline{x}$	1.398
Sample standard deviation, s	2.5846
Sample size, n	5
Critical concentration, Cc	3.2



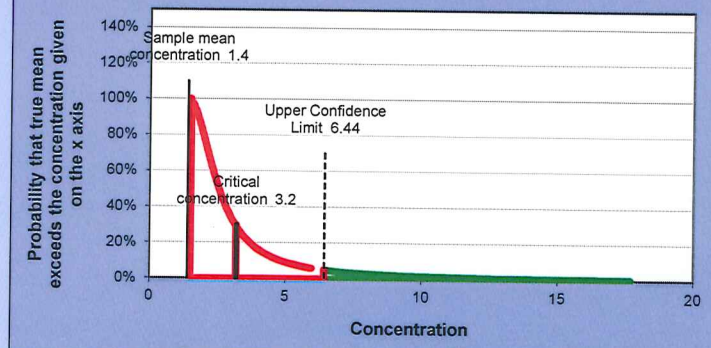
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	2



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	71%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	No

Not enough evidence

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX C

ARCHITECTURAL PLANNING DRAWINGS

Regis Road

A

light well

B

B

GIA
242m2

fl/ceiling
2.650m

fl/ceiling
3.400m

fl/ceiling
2.650m

court yard
light well

54 - 74

48 - 50

A

Holmes Road

0 2 4 6 10

N

DRAFT

52 HOLMES ROAD, LONDON, NW5 3AB

PROPOSED BASEMENT FLOOR PLAN

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: 1:200@A3
ISSUED FOR: PRE APP
FIRST ISSUED: 01/03/2016

4158/P/200

Regis Road

Holmes Road

0 2 4 6 10 N

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52 HOLMES ROAD, LONDON, NW5 3AB

PROPOSED GROUND FLOOR PLAN

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: 1:200@A3
ISSUED FOR: PRE APP
FIRST ISSUED: 01/03/2016

4158/P/201

Regis Road

A

B

B

sedum flat
roof below

15.5 sq m
B1
1.5 sq m
ES
0.9 sq m
B
2750
12 sq m
B2
1.3 sq m
3669
B1
16 sq m
1.26 sq m
1 sq m
ES
1054
B
1400
986
1.1 sq m
14 sq m
B2
2900
K
2 bed
84.8m2
3477
30 sq m
L
K
3476
D
2 bed
78m2
30 sq m
L
7.9 sq m
7.9 sq m
residential
entrance
below

54 - 74

48 - 50

A

Holmes Road

0 2 4 6 10 N

DRAFT

52 HOLMES ROAD, LONDON, NW5 3AB

PROPOSED TYPICAL (1st-4th)
FLOOR PLAN

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: 1:200@A3
ISSUED FOR: PRE APP
FIRST ISSUED: 01/03/2016

4158/P/202

Regis Road

A

B

B

MB
3430
25,6 m2
1.7 m2
10 m2
ES
B2
2956
0.7 m2
B1
3097
15 m2
1.3 m2
ES
0.8 m2
B
D
3 bed
110m2 GIA
K
L / D
30.3 m2

54 - 74

48 - 50

light well

pavement

A

Holmes Road

0 2 4 6 10

N

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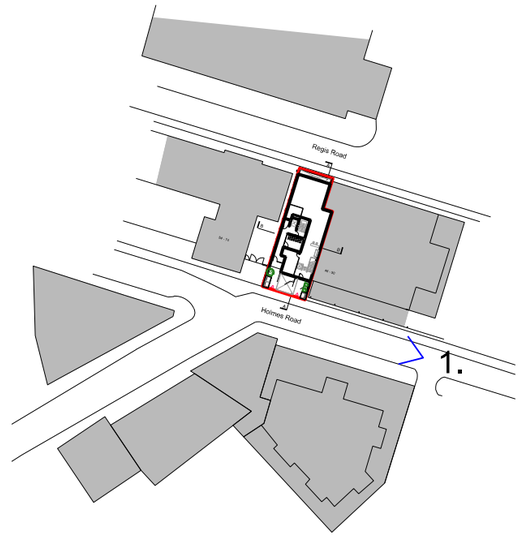
52 HOLMES ROAD, LONDON, NW5 3AB

PROPOSED TOP FLOOR PLAN

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: 1:200@A3
ISSUED FOR: PRE APP
FIRST ISSUED: 01/03/2016

4158/P/203



1. STREET VIEW FROM EAST

DRAFT

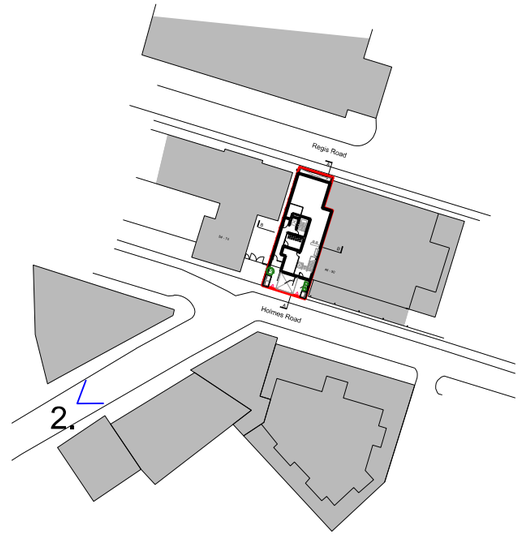
52 HOLMES ROAD, LONDON, NW5 3AB

3D VIEWS - OPTION 1

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: NTS
ISSUED FOR: PRE-APP
FIRST ISSUED: 01/03/2016

4158/P/240



2. STREET VIEW FROM SOUTH

DRAFT

52 HOLMES ROAD, LONDON, NW5 3AB

3D VIEWS - OPTION 1

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: NTS
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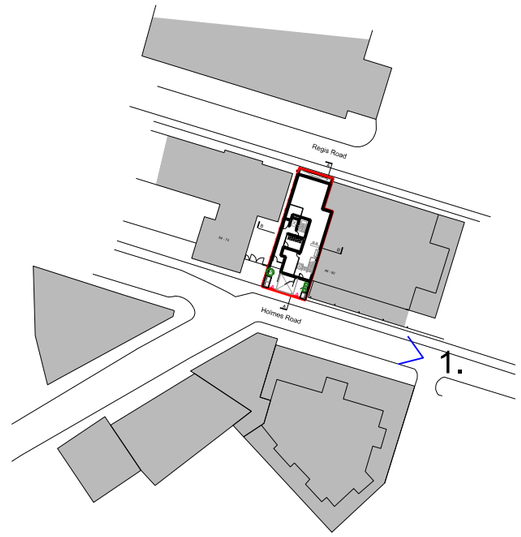
FIRST ISSUED: 01/03/2016

4158/P/241



1. STREET VIEW FROM EAST

DRAFT

52 HOLMES ROAD, LONDON, NW5 3AB

3D VIEWS - OPTION 2

G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
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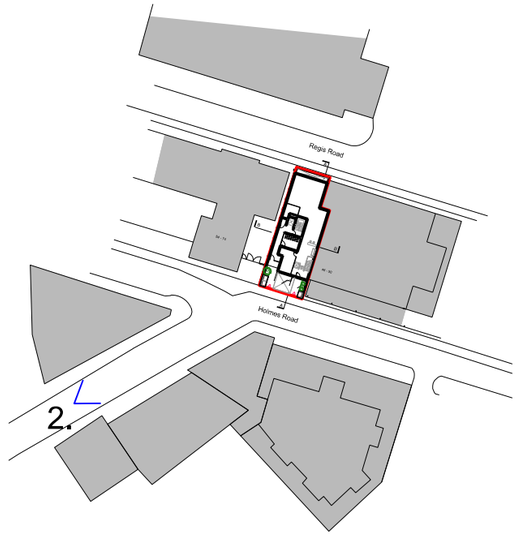
SCALE: NTS
ISSUED FOR: PRE-APP
FIRST ISSUED: 01/03/2016

4158/P/242



2. STREET VIEW FROM SOUTH

DRAFT

52 HOLMES ROAD, LONDON, NW5 3AB

3D VIEWS - OPTION 2

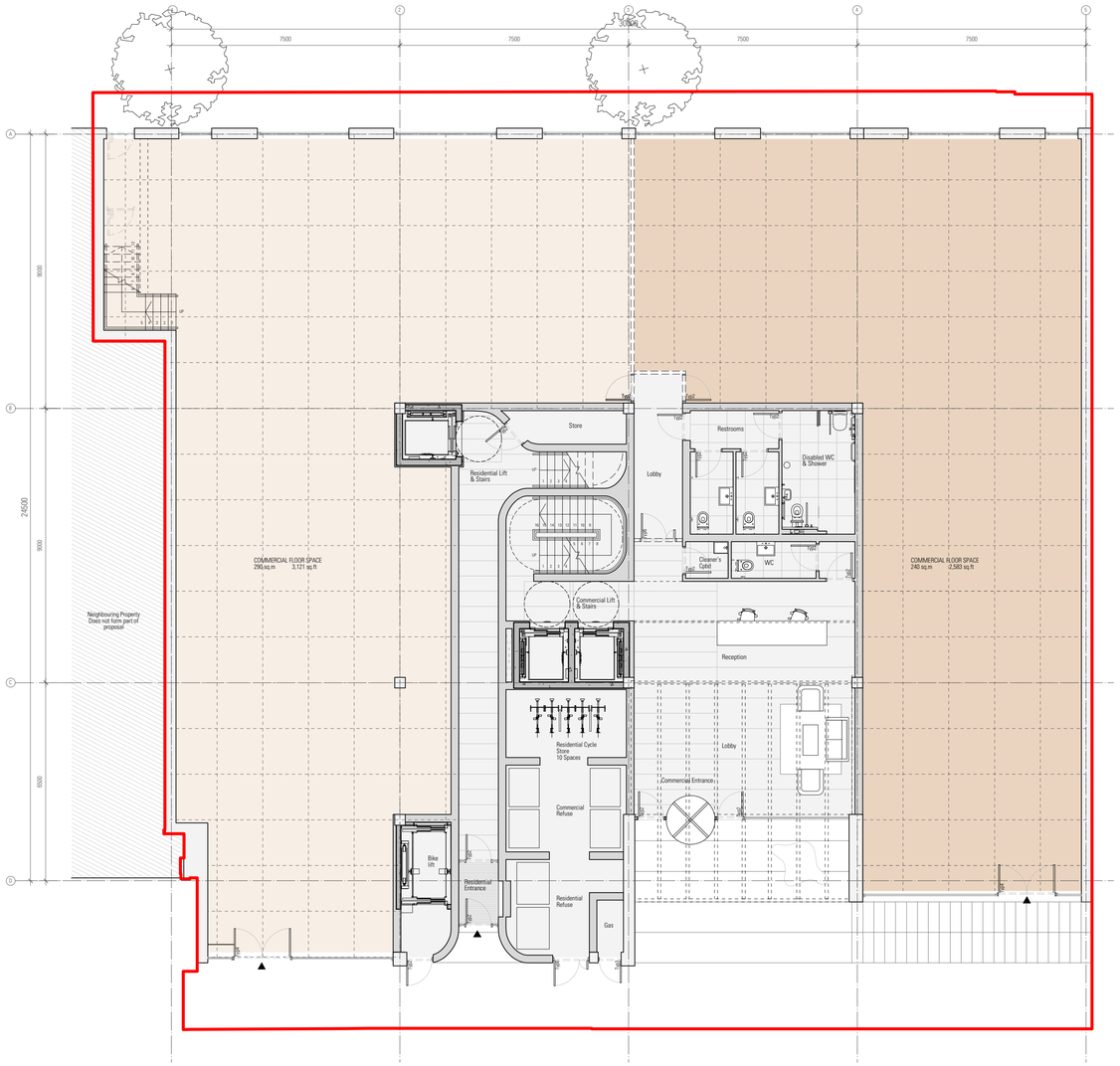
G M L A r c h i t e c t s
UNIT 3,1-4 Christina Street, London, EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk

SCALE: NTS
ISSUED FOR: PRE-APP
FIRST ISSUED: 01/03/2016

4158/P/243

APPENDIX D

PLANS FOR NO. 36-50 HOLMES ROAD



00 Proposed Ground Floor
Scale 1:100@A1, 1:200@A3

0m 2m 5m 10m 20m

Notes

P1	10/5/16	Revised for Pre-app

Revisions

HARPER DOWNIE
CREATIVE ARCHITECTURE

Gate House
1 St John's Square
London EC1M 4DH

T +44 20 7490 7674
studio@harperdownie.com
www.harperdownie.com

Client
Mr Daniel Lyons

Project
48 Holmes Road

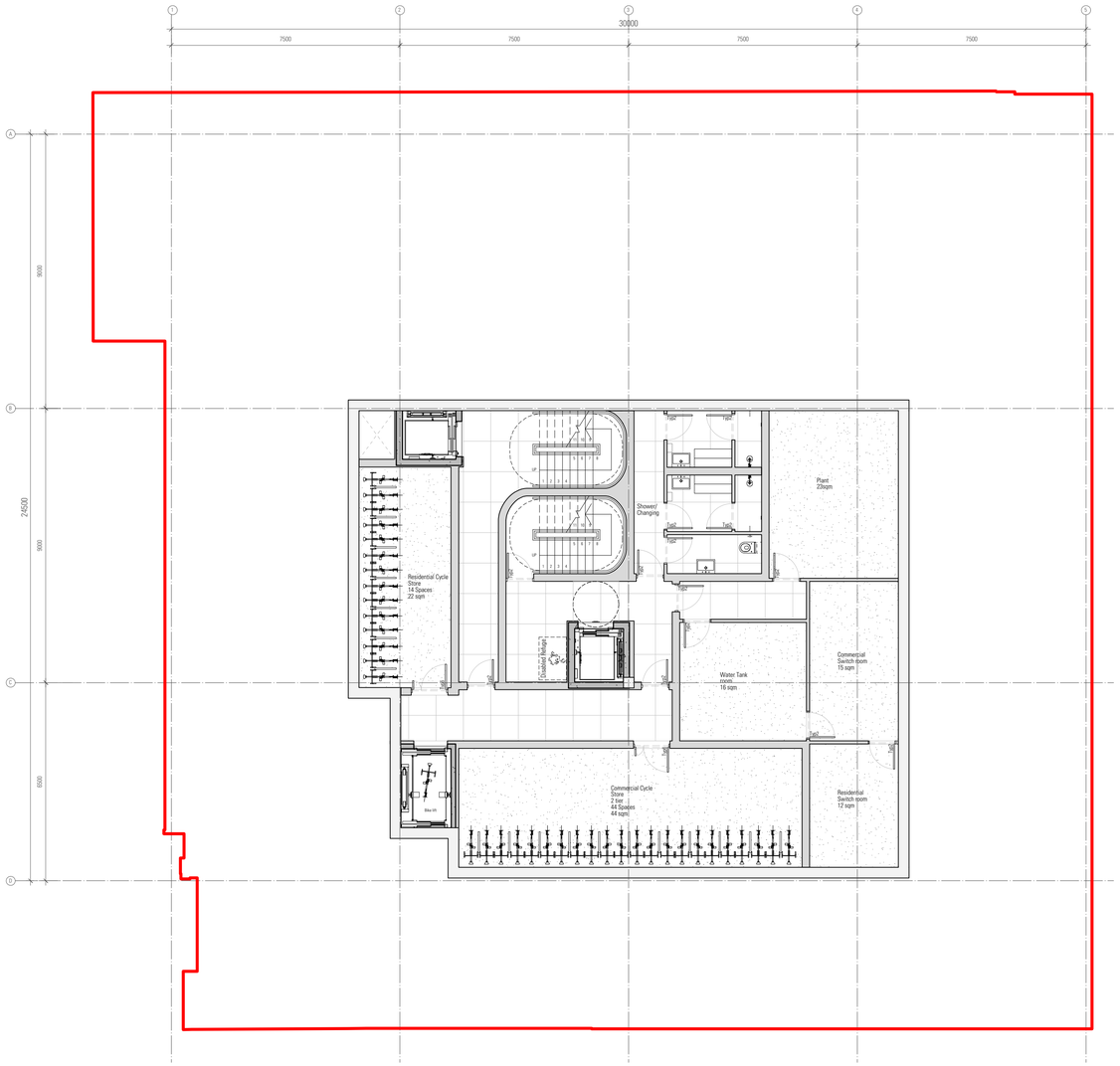
Drawing Title
Proposed Ground Floor Plan

Status	Drawn	Checked
Pre-application	NS	RE

Scale
1:100@A1 ; 1:200@A3

Date
May 2016

Drwg. No. & Revision
650_GA00_P2



LG Proposed Lower Ground Floor
Scale 1:100@A1, 1:200@A3

0m 2m 5m 10m 20m

Notes

Revisions

HARPER DOWNIE
CREATIVE ARCHITECTURE

Gate House
1 St John's Square
London EC1M 4DH

T +44 20 7490 7674
studio@harperdownie.com
www.harperdownie.com

Client
Mr Daniel Lyons

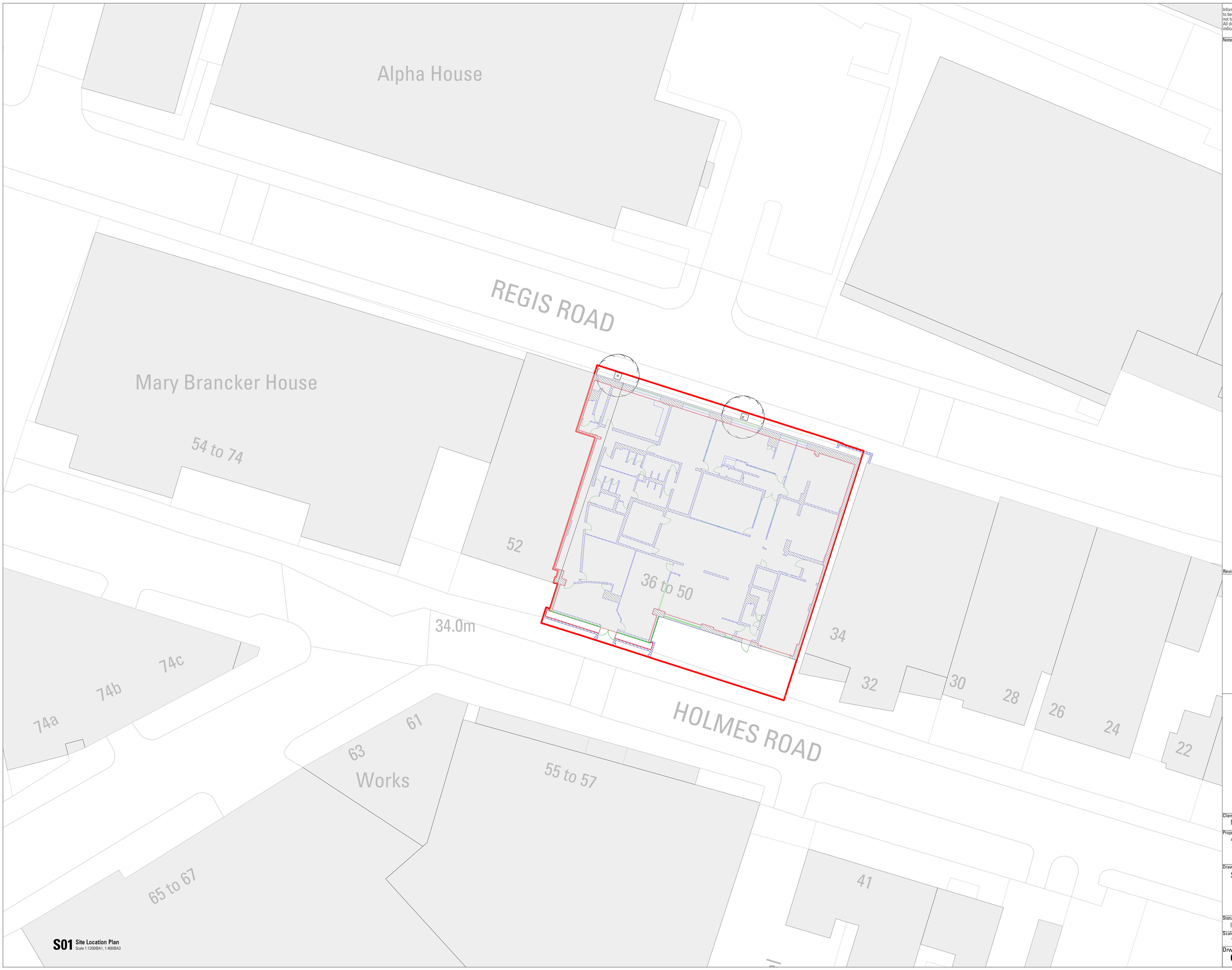
Project
48 Holmes Road

Drawing Title
Proposed Lower Ground Floor Plan

Status	Drawn	Checked
Pre-application	NS	RE

Scale	Date
1:100@A1 ; 1:200@A3	May 2016

Drwg. No. & Revision
650_GAB1_P1



S01 Site Location Plan
Scale 1:1200@A1, 1:400@A3

Notes

Revisions

Key:

Site Boundary

N

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Drawing Title
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Status	Drawn	Checked
Information	JD	RE

Scale	Date
1:200@A1 / 1:400@A3	mAY 2016

Drwg. No. & Revision
650_S02