12-0083

BASEMENT IMPACT ASSESSMENT

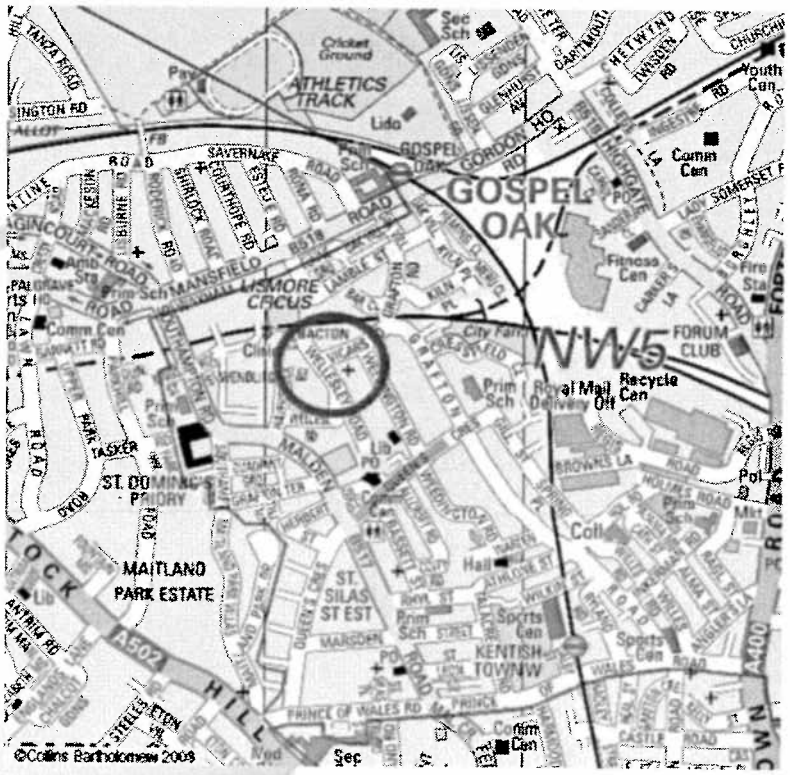
FOR

E C HARRIS LLP

AT

BACTON LOW RISE REDEVELOPMENT GOSPEL OAK, LONDON

REVISION B



Rolton Group Limited, Registered in England No. 1547400 at The Charles Parker Building, Midland Road, Higham Ferrers, Northants, NN10 8DN

CLIENT

The London Borough of Camden
1st Floor
33-35 Jamestown Road
London
NW1 7DB

PROJECT MANAGER

EC Harris LLP
Regent Quarter
34 York Way
London
N1 9AB

CONSULTING ENGINEERS

Rolton Group Limited
The Charles Parker Building
Midland Road
Higham Ferrers
Northants
NN10 8DN

REVISION & ISSUE RECORD

Revision	Date	Name & Position	Signature
/	November 2012	Author: Peter Atkinson (Senior Engineer) BSc PGDip MScCHE CEng CWEM MICE MIStructE MCIWEM FGS	Peter Atkinson
		Checked & Authorised: Andrew Chisem (Director) BSc (Hons) CEng MIStructE MCIOB	A.R. Chisem

Revision	Date	Name & Position	Signature
A	November 2012	Author: Peter Atkinson (Senior Engineer) BSc PGDip MScCHE CEng CWEM MICE MIStructE MCIWEM FGS	Peter Atkinson
		Checked & Authorised: Andrew Chisem (Director) BSc (Hons) CEng MIStructE MCIOB	A.R. Chisem

Revision	Date	Name & Position	Signature
B	February 2013	Author: Peter Atkinson (Senior Engineer) BSc PGDip MScCHE CEng CWEM MICE MIStructE MCIWEM FGS	Peter Atkinson
		Checked & Authorised: Andrew Chisem (Director) BSc (Hons) CEng MIStructE MCIOB	A.R. Chisem

NOTE: IMPORTANT INFORMATION ABOUT YOUR RIGHTS TO READ AND USE THE CONTENT OF THIS DOCUMENT ARE CONTAINED AT THE BACK OF THIS DOCUMENT

ISSUING OFFICE:-

Higham Ferrers Office
The Charles Parker Building
Midland Road
Higham Ferrers
Northants
NN10 8DN

Peterborough Office
No 1 Minerva Business Park
Lynch Wood
Peterborough
PE2 6FT

Solihull office
No.6 The Courtyard
707 Warwick Road
Solihull
West Midlands
B91 3DA

TEL – 0870 726 0000 FAX 0870 726 0222

CONTENTS

1.0 INTRODUCTION

It is proposed to redevelop a predominantly residential area of Gospel Oak owned by the London Borough of Camden Council. The site consists of two adjoining parcels of irregularly shaped land – the larger known as the Bacton Low Rise Estate consists of blocks of residential flats; the smaller parcel known as the District Housing Office site is used by Camden Council for offices and there are some small business units here also.

Redevelopment will consist of demolition of the existing buildings and construction of 3- to 7-storey blocks of residential flats, communal facilities and commercial units. The work will include new construction against neighbouring properties and will involve construction of a basement and therefore, to be in accordance with the requirements of the London Borough of Camden's planning guidance, a Basement Impact Assessment is required for the purposes of ensuring that the ground, groundwater and structures on and around the site are not adversely affected.

Guidance on the procedures for undertaking a Basement Impact Assessment (BIA) is given in the following documents:

- *Camden Planning Guidance 'Basements and Lightwells' CPG 4*, London Borough of Camden
- *Camden Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development*, Arup

Rolton Group Ltd (RGL) has been instructed by EC Harris LLP (acting as Project Managers for the London Borough of Camden) to undertake the necessary investigations and prepare a BIA for the proposed redevelopment work. This report presents the findings of desk studies and investigations and the resulting BIA. This report has been prepared to support a full planning application. The report is arranged as follows:

- Section 2 describes the existing site and buildings.
- Section 3 describes the proposed development scheme.
- Section 4 lists the existing investigation reports and summarises the findings.
- Section5 presents the initial screening to determine what issues require more detailed assessment.
- Section 6 presents the detailed stage of the BIA.
- Section 7 discusses the findings and conclusions of the BIA.
- Section 8 lists main reference documents.

- Appendix A presents the site location plan and exploratory hole layout.
- Appendix B presents the desk study Envirocheck Report.
- Appendix C presents the exploratory hole logs.
- Appendix D presents plans and sections illustrating the works adjacent to the boundaries.
- Appendix E contains copyright information about this report.

2.0 SITE AND EXISTING BUILDING

The application site consists of two adjoining parcels of land owned by the London Borough of Camden.

The smaller parcel covers around 4 hectares and occupies the north east of the site – it is bounded by a railway line in a 6-8m deep cutting to the north, Vicars Road to the south and Wellesley Road to the west. It is presently occupied by Camden Council (who occupy a 3-storey office block plus temporary office units at the rear), a community Hall, a Council materials storage yard and a block of 2-storey business/commercial units.

The parcel to the south west covers some 7 hectares and is bounded by Wellesley Road to the east and south and Haverstock Road to the west. It is occupied by a number of 4-storey blocks of flats arranged around 3 courtyards with planting and car parking.

A Site Location Plan is given in Appendix A; the existing site arrangement is shown on the Exploratory Hole Layout also in Appendix A.

Ground levels fall from around 45m AOD at the west of the site to around 41m AOD in the east.

3.0 PROPOSED DEVELOPMENT

The proposal is to demolish the Council offices, commercial/business units and the existing residential flats and to construct new blocks of mainly residential flats on both parcels of land. Some features of the proposed development will include:

1. On the southern parcel 3- to 5-storey blocks of flats will be constructed around 2 garden areas.
2. On the northern parcel a 7-storey block of flats will be constructed in the north east corner – this and a long 3-storey block will back onto the railway line. Further 3- to 5-storey blocks will be built on this parcel.
3. Small commercial/business units will be provided at ground floor level in certain of the blocks with the residential flats above.
4. A new access road will bisect the southern parcel.
5. Wellesley Road, Vicars Road and Haverstock Road will be essentially unchanged.
6. The community Hall in the north of the site will be retained.
7. A plant room basement is proposed to part of one block of flats located adjacent to Haverstock Road.

Work on the southern parcel will involve construction adjacent to the surrounding roads and footpaths but not in close proximity to any existing buildings.

Works on the northern parcel will involve construction in proximity to the railway line and the community Hall and also to a residential block of flats and a preparatory school fronting on to Vicars Road.

Redevelopment of the site will not require significant changes to existing ground levels but some minor reshaping of levels to suit the new buildings will be required – generally of less than 1m height.

A plan showing the proposed location of the new basement is presented in Appendix D.

4.0 SITE INVESTIGATIONS

4.1 GENERAL

The site has been subject to a Phase 1 Geo-environmental Desk Study and a preliminary phase of intrusive ground investigation works, consisting of boreholes and laboratory testing on recovered soil samples. Ground gas monitoring has also been undertaken.

The findings of the Desk Study were reported upon in the following document:

- *Phase 1 Geo-environmental Desk Study for EC Harris LLP, at Bacton Low Rise, Gospel Oak, London*, dated May 2012.

Following the subsequent preliminary intrusive investigations an interpretative report was produced summarising the desk study, intrusive works and testing and monitoring. This report is:

- *Geotechnical and Geo-environmental Report for EC Harris LLP at Bacton Low Rise Estate, Gospel Oak, London*, dated October 2012.

A substantial part of the Phase 1 Desk Study interprets information within an Envirocheck database report. The Envirocheck Report, including historic mapping, is presented in Appendix B.

4.2 GEOLOGY

The British Geological Survey map for North London (BGS Sheet 256, 1:50,000) indicates that the site and surrounding land is underlain by the London Clay Formation, described as 'clay, silty in part'.

The boreholes have confirmed that the site is underlain by 0.9-2.0m of made ground mainly consisting of sandy gravelly clay containing fragments of brick, concrete, slate and clinker. The made ground is underlain by London Clay which was found to be a firm to stiff sandy clay at its surface becoming a stiff to very stiff fissured clay with claystones at depth. The London Clay continued beyond the depth of each of the boreholes which were drilled to between 19.65 and 30.15m below ground level.

4.3 GROUNDWATER

During the borehole drilling work, groundwater was encountered in a single borehole only – this consisted of a seepage at 0.5m depth in made ground in borehole BH7. All other boreholes were dry during drilling.

Post-installation monitoring of the borehole standpipes showed groundwater to be present at a variety of depths of between 1.59m and 9.55m below ground level, with borehole BH4 being dry. This indicates the presence of discrete minor volumes of water in the made ground rather than what might be termed a groundwater table as such.

The borehole logs are presented in Appendix C.

A tributary of the former River Fleet is likely to have flowed across the site (from north to south) until the late nineteenth century when it was then culverted– no evidence of this watercourse was found.

5.0 SCREENING

In accordance with the guidance issued by the London Borough of Camden, indicated in Section 1.0 above, an initial screening exercise is carried out to identify what detailed investigations and assessments are required in order to develop a fully detailed and comprehensive BIA. The screening results are indicated below:

5.1 SURFACE FLOW AND FLOODING

Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?
Answer: ***No, the site is located around 500m to the south of Hampstead Heath and at ground levels some 5-10m below those at the southern edge of the Heath local to the ponds.***

Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?
Answer: ***No, the site is presently almost entirely hard surfaced and therefore the amount of water to be disposed of via the stormwater system and the locations for this discharge will remain substantially unchanged.***

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?
Answer: ***No, the proposed redevelopment of the site will result in the same proportion of hard surfaced/paved external areas.***

Question 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?

Answer: ***No, the proposed development of the site will result in the same proportion of hard-surfaced/paved external areas and therefore surface water flows will be almost entirely unaffected. The proposed basement will have no effect whatsoever on surface water flows.***

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?
Answer: ***No, the proposed development will have no adverse effect on flows or water quality. Stormwater will be discharged to the same off-site destinations – replacement of most of the on-site drainage system will probably improve water quality by excluding foreign material presently entering the system via damaged pipes and chambers. The potential for vehicle pollutants to enter the system should also be substantially reduced.***

Question 6: Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?
Answer: ***Environment Agency mapping shows that the site is not at risk from flooding from rivers. A Hydrological report by Arup for Camden Council does show the Railway line to the immediate north as potentially at risk of flooding and part of Haverstock Road at the west boundary is shown to have flooded in 2002. The proposed basement is not considered to be below any static water table.***

5.2 SUBTERRANEAN (GROUNDWATER) FLOW

Question 1a: Is the site located directly above an aquifer?
Answer: ***No, the local geology map (BGS Sheet 256, North London, 1:50,000) indicates that the site is underlain by the London Clay Formation and this has been confirmed by boreholes undertaken on site.***

Question 1b: Will the proposed basement extend beneath the water table surface?
Answer: ***No, the basement will extend through shallow made ground into London Clay. No significant groundwater has been detected in the made ground and the London Clay is effectively impermeable.***

Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?
Answer: ***No. A former tributary of the River Fleet flowed north to south across the site but this was culverted in the late nineteenth century and the route has been completely severed by the Railway in a deep cutting at the northern boundary.***

Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?
Answer: ***No, the site is located at around 500m south of the ponds on Hampstead Heath and at ground levels of around 40-45m above ordnance datum (AOD). Hampstead Heath is generally at least 50m AOD.***

Question 4: Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?
Answer: ***No, the majority of the site is hard surfaced and the proportion will remain the same.***

Question 5: As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?
Answer: ***No, the site is not considered suited to the use of soakaways because of the geology and the proximity of buildings. Natural ground consists of London Clay which is effectively impermeable for drainage purposes.***

Question 6: Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line.
Answer: ***No, there are no ponds or similar within at least 250m of the site.***

5.3 SLOPE STABILITY

Question 1: Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)
Answer: ***There are no slopes steeper than 7 degrees but there are existing retaining walls along the northern boundary where a Railway line is present in a cutting at 6-8m below site level.***

Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees? (approximately 1 in 8)
Answer: ***No, the site ground profile is not going to be significantly changed.***

Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees? (approximately 1 in 8)
Answer: ***Yes, the site is located adjacent to a Railway line in a cutting at the northern boundary. The cutting is formed by near vertical brick masonry retaining walls of 6-8m height.***

Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)
Answer: ***No, surrounding land is only very shallowly sloping – at around 0-4 degrees.***

Question 5: Is the London Clay the shallowest strata at the site?
Answer: ***Yes, although covered by 0.9-2.0m of made ground.***

Question 6: Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?
Answer: ***Yes, some trees will be felled. The proposed works are not within a tree protection zone.***

Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?
Answer: ***The London Clay is associated with seasonal shrink-swell subsidence however there is no evidence of such movements having caused structural damage at the site.***

Question 8: Is the site within 100m of a watercourse or a potential spring line?
Answer: ***No, the nearest watercourse is recorded as being over 400m from the site to the north. The nearest potential spring line is the interface of the London Clay and the overlying Claygate Member – this interface is located over 750m to the north and north west.***

Question 9: Is the site within an area of previously worked ground?
Answer: ***No. Historic mapping shows no past workings at the site.***

Question 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 construction?
Answer: ***No, the site is not over an aquifer.***

Question 11: Is the site within 50m of the Hampstead Heath ponds?
Answer: ***No, it is over 500m from Hampstead Heath.***

Question 12: Is the site within 5m of a highway or pedestrian right of way?
Answer: ***Yes, there are a number of roads at the site boundaries together with access roads and pedestrian rights of way crossing the site.***

Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?
Answer: ***The proposed basement is located in proximity to Haverstock Road and construction will be to a depth of up to around 6m below the road level. The two blocks along the northern boundary will be in close proximity to the Railway line in a cutting and foundations will be at a significantly higher level than those to the retaining walls here.***

Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?
Answer: ***No, the site is not located over or in close proximity to any Railway or Underground lines in any tunnels.***

5.4 RESULTS OF SCREENING

5.4.1 Surface Flow and Flooding

- There are no issues that require more detailed assessment.

5.4.2 Subterranean (Groundwater) Flow

- There are no issues that require more detailed assessment.

5.4.3 Slope Stability

- Construction works are proposed within 5m of a highway and pedestrian rights of way.
- Construction is also proposed adjacent to a Railway in a cutting.
- The site is underlain by London Clay and trees will be felled as part of the redevelopment.

A more detailed assessment is therefore required of slope and ground stability and how these will be affected both temporarily and permanently.

6.0 DETAILED ASSESSMENT SLOPE (GROUND) STABILITY

6.1 DEMOLITION AND SITE CLEARANCE

There are no existing basements at the site. Existing foundations are likely to be spread foundations consisting of brickwork or concrete strips and therefore deep excavation during demolition is not anticipated. There is no proposal to demolish any wall that is providing support to any road, neighbouring building or adjacent property or that is providing support to the site in such locations.

6.2 FOUNDATION CONSTRUCTION

6.2.1 Piling

Because of the presence of made ground of up to 2m depth it will be necessary to provide piled foundations to the proposed new construction. Continuous Flight Auger (CFA) piling will be utilised. This minimises noise and vibration and is regularly used in the industry when piling close to existing buildings – a safe distance of around 1m is frequently employed without detrimental effects to load-bearing, framed and even historic structures.

This technique is suitable to be used in loose or even waterlogged soils – as the piling auger is extracted, having reached design depth, the pile bore is filled with concrete via injection of concrete under pressure from the auger tip. In this way there is at no time during the piling operation an open or unsupported pile bore or risk of ground collapse or movement around the pile location.

The soil removed by the piling operation is solely the soil volume equal to the volume of the pile concrete that is immediately placed during piling. Groundwater is not extracted or affected in any way – there is no requirement to pump or otherwise extract or move groundwater.

In proximity to the existing retaining wall forming the Railway cutting at the northern site boundary all piles will be designed so that all loads are carried by soils below the level of the ground beneath the Railway line, thereby preventing transfer of any additional loads on to the retaining wall – see the cross section in Appendix D.

From the above, it is considered that the proposed piling will not adversely affect the structural stability of adjacent properties (either foundations or superstructures) or groundwater, either in the temporary case during construction or after completion of all construction works.

6.2.2 Basement Construction

A relatively small basement is proposed on site for plant and waste storage – located adjacent to Haverstock Road part way along the western boundary of the site– see the plan in Appendix D.

The depth of the floors to the basement will be around 4m below ground level and hence through any made ground and into the underlying London Clay. The excavations will be supported by steel sheet piles driven to a depth of around 8m below ground level (each pile will initially be installed by use of high-frequency vibratory technique with impact driving only used if the full depth of installation cannot be achieved by vibratory technique alone). The sheet piles will be driven from ground level after demolition and site clearance and following installation of the foundation piles to the proposed buildings. A number of concrete load-bearing piles will be located within the footprint of the basement and therefore within the sheet piled area.

The basement will then be excavated to a level of approximately 4.5m below general ground level with the concrete piles within the basement footprint simultaneously broken down to the same level. The steel sheet piles at this stage will be acting as cantilevers with raking shores provided as required to prop the tops of the sheet piles to minimise horizontal deflection of the sheet piles. Reinforced concrete pile caps will then be constructed at the underside of the proposed basement floor with the maximum depth of excavation being to a level of approximately 6m below ground level.

The floors of the basement will then be constructed in reinforced waterproof concrete. The basement floor will bear onto the exposed London Clay and also the pile caps. The walls to the basement will also consist of reinforced waterproof concrete cast against the steel sheet piles and continuous with the floor slab to provide a complete reinforced concrete box construction inside the sheet-piled perimeter. The steel sheet piles will be cut down below general ground level but will form part of the permanent works.

Noise and vibration monitoring of the sheet piling will be undertaken in proximity to ensure that adjacent properties (buildings and services) are not adversely affected and to ensure that neighbouring residents and site users are not subject to harmful noise levels or excessive vibrations. Suitable levels of noise and vibration are to be agreed with Camden Council Environmental Health Dept.

6.2.3 Ground Beams and Pile Caps

Ground beams and pile caps will generally be constructed in insitu reinforced concrete at a depth of around 1m below ground level – the exception being those pile caps within the footprint of the proposed basements which will be constructed as described above.

6.3 GROUNDWATER CONTROL

There will be no need to undertake dewatering of the ground in order to undertake excavation for foundations or new sewers. The only requirement will be to control casual water in excavations resulting from perched water seepages and inflow from rainwater at the surface; excessive collection of water in excavations will be prevented. Such water will be collected by small pumps as required and disposed of (by agreement with the relevant authority) to the foul sewer system via a suitable collection system or silt trap as required.

The works are not therefore considered likely to significantly affect the groundwater regime at the site or in the near vicinity.

6.4 GROUND STABILITY

The excavations for the new basement will be supported by sheet piles as described above.

Excavations for deep sewers will be supported by use of trench boxes – including making connections to existing sewers in Haverstock Road, Wellesley Road and Vicars Road. No deep sewers are proposed adjacent to buildings.

No other deep excavations are proposed – all other excavation for services and foundations will be to around 1.0m depth only.

The integrity of the formation to excavations will be preserved by placement of blinding concrete immediately after reaching the require foundation depth and arrangement.

All voids under, around or above the indicated foundations and below the existing ground surface level will be filled with suitable inert durable compacted granular fill or structural concrete. All blinding concrete and mass concrete will have a minimum compressive strength of 10N/mm^2.

6.5 FOUNDATION DESIGN

Adjacent to the railway line all foundation loads will be transferred by load-bearing piles to strata below the base of the Railway cutting – see the cross section in Appendix D.

Elsewhere across the site there are no locations where the ground level at the boundary is stepped or at a steep angle such that new foundations will impose loadings on adjacent structures.

In proximity to existing trees (either to be removed or retained) all foundations will be designed to cater for moisture-related ground movements – heave and /or shrinkage. Guidance for such designs is given by National House-Building Council (NHBC) Standards, specifically Chapter 4.2 'Building Near Trees'. Precautions are likely to include provision of compressible liners to the underside and inside of ground beams and the additional reinforcement to piles to cater for upward heave forces.

7.0 CONCLUSIONS AND RECOMMENDATIONS

This Basement Impact Assessment has identified that the proposed redevelopment works at the site will likely have no significant effect on surface water flow, the risk of flooding or on subterranean groundwater flow.

The only potential adverse impact of the work will be on the stability of adjacent ground, retaining walls and building foundations as a result of temporary excavation for new foundations including the new basement. Works to mitigate these impacts are described above:

- Load-bearing piles will be formed by Continuous Flight Auger (CFA) to minimise ground and groundwater movements;
- The basement will be formed by use of permanent steel sheet piles;
- Other deep excavations for sewers will be supported by traditional trench boxes.

The design of the foundations and temporary works will need to be worked up into more detailed drawings and specifications before commencement on site. In addition it will be necessary to obtain party wall agreements and the specific approval of the Highways Department responsible for the local roads and footpaths.

The findings of this BIA must be fully incorporated into construction details and specifications in order to obtain agreement with adjoining owners and before any works commence on site.

The works described in this BIA assume full-time and appropriate supervision is provided on site at all times including during the piling, excavation and construction works and that any anomalous ground or groundwater conditions (or conditions different to those described here) will be identified and immediately reported to Rolton Group for our consideration and advice and revision to this BIA as necessary. Conditions that should be reported to RGL include (but are not confined to):

- Soft or especially loose soils or the presence of voids in the ground.
- Different soil types than recorded to date on exploratory logs.
- Shallow groundwater.
- Evidence of damage, deterioration or any form of instability (past or present) to existing foundations, walls or structures.
- Any evidence of possible ground movement or building movement.
- Unrecorded drain runs or other buried services.
- Any evidence of buried wastes or contaminated materials.

This report does not replace the need for the preparation of appropriate methods of work, specifications and risk assessments.