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The Ridings, 4 Village Close, Sherington, Bucks, MK16 9PZ T: 020 8133 4418 W: www.tgen.co.uk

Remediation Strategy

for

3 Holford Road London NW3 1AD



on behalf of

Chelmer Site Investigations

Our ref.: TJ2239WR1 June 2010

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PREPARED BY	REVIEWED BY
M.	
Paul Brewer Senior Environmental Consultant BSc (Hons), MSc, MI Soil Sci, CSci	Dr Barry Powell BSc (Hons), PhD, MCIWM Principal Consultant
(for and on behalf of Terragen Envi	ironmental Consultants Limited)



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1.0 INTRODUCTION

Terragen Environmental Consultants Limited (TGEN) was commissioned by Chelmer Site Investigations (the client), via a written (emailed) instruction to proceed, dated 07/06/2010, to compile a remediation strategy for 3 Holford Road, London, NW3 1AD (the site).

1.1 Proposed Development

Camden Council (the local planning authority) granted planning permission (2009/4699/P) for excavation to create a rear basement floor level with associated roof lights within the rear garden and installation of a car lift within the front garden for a single family dwelling (Class C3) on 04/06/2010 subject to a Section 106 Legal Agreement.

An existing site plan is presented in Figure 1, a proposed site plan is presented in Figure 2 and a proposed cross section is presented in Figure 3.

As can be seen from the plans listed above, the works to the front elevation include for the excavation of an underground parking area, which will be under the footprint of the existing driveway and to the rear elevation the excavation of a large basement to include a gymnasium and swimming pool, which will be partially under the footprint of the existing building and proposed extension and partially below the footprint of the existing garden and lawn. As such there will be significant excavations to the front and rear garden areas to form the new underground parking, gymnasium and swimming pool. In addition we understand that the majority of front garden will remain under hard-standing driveway with some extension of the landscape planting. The majority of the rear garden is to be retained with some re-landscaping.

1.2 Background Information

During a previous site investigation undertaken by the client (ref. 1805 dated November 2009) a number of exploratory holes were excavated across the site as part of a geotechnical assessment of the ground conditions.

Ground conditions encountered can be summarised as follows:-

Made Ground	Dark brown, loose to medium compact, silty gravelly coarse sand with fragments of brick and concrete.	A thickness of circa 1.1m in rear garden and 3.2m to the front.
Sand	Mid brown to orange, becoming olive medium dense, silty, fine sand with lenses of clay.	Underlying the made ground to a depth of circa 15mbgl.

The strata encountered is as per the geological succession published in the geological survey map (1:50,000 scale, British Geological Survey, Sheet 256, North London, Solid and Drift Edition) for the Hampstead area (i.e. Bagshot Formation (sand) over Claygate Member (silt and fine-grained sand) over London Clay). To the front of the property circa 0.2m of hard-standing was encountered at the top of the profile and to the rear circa 0.1m of topsoil.

During the investigation undertaken by the client four (4) samples of the near surface soils were recovered and submitted to a UKAS accredited laboratory for chemical testing. Three (3) of the samples were subjected to a general suite of potential contaminants and one (1) sample, representative of the near surface soil (made ground), was subject to waste acceptance criteria (WAC) tests including two-stage leaching to BS EN 12457-3. The results of the chemical testing are discussed in our previous report (ref. TJ2239QR2 dated 04/12/2009), which should be read in conjunction with this remediation strategy.



Samples submitted for chemical testing from the investigation undertaken by the client included:-

- BH1 @ 2.0mbgl Made ground from under the driveway at the front of the house in area of the proposed underground car park.
- BH2@0.5mbgl Made ground below the topsoil under the rear lawn in area of the proposed basement swimming pool.
 - TP4 @ 1.0mbgl Made ground at the rear of proposed rear garden.

From the proposed plans and cross-section drawings presented in Figures 2 and 3, excavation at the front of the property associated with the underground car park will be circa 2.6m deep and to the rear of the property associated with the gymnasium/swimming pool will be circa 4.9m deep.

Therefore the materials represented by BH1 @ 2.0mbgl and BH2 @ 0.5mbgl will be removed as part of the basement excavations. The material represented by TP4 @ 1.0mbgl will not be within the perimeter of the basement excavation and as such will potentially remain on site.

1.3 Summary of Previous Report Findings and Recommendations

In general the results returned by the three (3) samples subjected to a general suite of potential contaminants were below their respective general assessment criteria (GAC) threshold for a residential end-use scenario. The only exception to this was one (1) slightly elevated concentration of total lead (588mg/kg) returned by the sample from BH2 @ 0.5mbgl, which could be considered a potential risk to human health if the soils represented by this sample were to be retained in-situ within sensitive end-use areas of the site. Analysis of a sample of the same material from the same borehole demonstrated that potential contaminants were not significantly leachable.

1.3.1 Measures to Protect End Users / Human Health

The results indicate that as part of any development at the site remedial measures would be required to break exposure pathways. The following recommendations are given on the basis of a residential development, with areas of private garden, where there is the potential for crops to be grown for consumption.

Areas of hard-standing (e.g. building footprint, roadways etc.)

In areas of permanent hard-standing such as the building/basement footprint, driveways, paths and roadways etc., which comprises a significant proportion of the site, the development itself would adequately break exposure pathways to human health and therefore remedial measures will not be required in these areas.

• Sensitive End-Use Areas (Private Garden Areas etc.)

In areas of sensitive end-use, such as gardens, additional measures are required within the development plans to mitigate risks to end-users and break exposure pathways. In accordance with BRE (2004) Cover Systems for Land Regeneration: Thickness of Cover Systems for Contaminated Land, if the in-situ soils were to be retained, then in areas of garden on average a minimum of 130mm* of soils validated as being free from significant contamination should be placed above the in-situ site soils to break the exposure pathway to the existing made ground.

It should be noted that changes in site levels may require planning approval and/or may not be appropriate for the site. It may therefore be necessary to remove and dispose of an equivalent depth of soil (i.e. 130mm) from proposed garden areas prior to placement of the imported soils to the required depth.

* This is based on the maximum concentration for lead of 588mg/kg for the site soils and an assumed value of 50% of the Residential GAC value for lead for the imported soils.



1.3.2 Classification of Waste Arisings

In accordance with statutory guidance, the only materials allowed for disposal/recovery to inert permitted waste facilities without detailed information (e.g. chemical analyses, site investigation data etc.) should be restricted to single source uncontaminated material from a known site and a reliable producer. The material from the site/source should not be contaminated and should not contain significant quantities of deleterious materials such as wood, plastic etc. Materials potentially suitable for recovery at such inert permitted waste facilities without laboratory analysis should be restricted to the following:-

Table 1. Inert Waste Materials	(The Landfill ((England & Wales)	(Amendment)	Regulations 2004 -	Part 3(10))
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EWC Code	Description	Restrictions
17 01 01	Concrete	Selected C&D waste only ¹
17 01 02	Bricks	Selected C&D waste only ¹
17 01 03	Tiles & Ceramics	Selected C&D waste only ¹
17 01 07	Mixture of Concrete, Bricks, Tiles & Ceramics from a Single Source.	Selected C&D waste only ¹
17 05 04	Soil & Stones (e.g. Natural Clays & Sands etc.)	Selected C&D waste not from contaminated sites ¹ (excluding topsoil/peat when used as subsoil or fill)
20 02 02	Soil & Stones (e.g. Natural Clays & Sands etc.)	Selected Garden & Park waste only ¹ (excluding topsoil/peat when used as subsoil or fill)

NOTE:

- 1. Selected Construction & Demolition (C&D) or Garden & Park (Municipal' waste with low (non significant) contents of other types of materials (i.e. metals, plastics, organics, wood, rubber etc). The origin of the waste must be known and relevant information regarding the waste must have been assessed.
 - No C&D waste from buildings/land contaminated with dangerous substances (e.g. 17 01 06 & 17 05 03).
 - No C&D waste from buildings treated/painted with dangerous substances in significant amounts.
- 2. These materials should only be accepted if they arise from a single identified source.
- 3. Mixtures of different types of these wastes from the same single source are acceptable without testing.

4. Mixtures of these wastes from different sources are not acceptable unless pre-testing is carried out.

As such the natural strata at the site (e.g. sand of the Bagshot Formation) would be considered suitable for disposal to an inert permitted facility as uncontaminated soil & stones (LoW Code 17 05 04) without the need for chemical testing.

Based on the chemical testing undertaken, and in accordance with Environment Agency (2008) Interpretation of the Definition and Classification of Hazardous Waste (Technical Guidance WM2, 2nd Edition, v2.2 May 2008), we would describe the made ground chemically as follows:-

Ref	Depth (mbgl)	Description	Hazardous / Not Hazardous	Likely Disposal Classification
BH1	2.0	No significant contamination	Not Hazardous	Non-Hazardous
BH2	0.5	Very slightly elevated lead	Not Hazardous	Non-Hazardous
TP4	1.0	No significant contamination	Not Hazardous	Non-Hazardous

The above classifications should be confirmed with the receiving facility and/or Environment Agency prior to disposal.

Based on the solid analysis undertaken, it is our opinion that all of the materials represented by the samples (i.e. the made ground) should be properly classified as either inert or non-hazardous waste for disposal purposes off site. Testing (i.e. leaching to BS EN 12457-3) to demonstrate compliance with Waste Acceptance Criteria (WAC) in accordance with the Landfill Directive and UK waste management permitting regulations was undertaken on one (1) representative sample of the made ground. The sample returned low leachable concentrations of a wide range of leachable contaminants with the exception of fluoride and antimony, which marginally exceeded the threshold limits for classification of such material as inert waste for disposal to an inert permitted landfill site. On



this basis the made ground at this site should be properly classified as uncontaminated soil & stones (LoW Code 17 05 04) suitable for disposal to a non-hazardous landfill or recovery/recycling/re-use at an appropriate waste management facility, such as low risk construction facility qualifying as being exempt from waste management permitting regulations (e.g. U1 Use of waste in construction) as is proposed in the Design & Access Statement.

In addition we understand from the Design and Access Statement that, where encountered, it is proposed to strip the topsoil and retain it for re-use on site as part of the re-instatement of the garden areas, after the basement has been constructed. We would recommend that the designations be confirmed with a receiving facility prior to recovery/disposal of any materials off-site.

2.0 REMEDIATION STRATEGY

2.1 Validation Testing of Garden Soils

As noted in Section 1.3.1 measures to protect end-users are be required to be implemented in sensitive end-use areas (e.g. gardens) should the soils represented by BH2 @ 0.5mbgl remain on site. From the exploratory hole location plan included within the site report produced by the client (ref 1805 dated November 2009) it would appear that this location coincides with the footprint of the rear basement excavation and as such we would expect the materials represented by this sample to be largely removed from the site.

To confirm that this is the case, we recommend that during the earthworks programme additional samples be taken from the made ground at 0.1-0.6mbgl at circa six (6) locations in the rear garden and tested for total lead. A statistical assessment should be carried out on the results to determine the extent of remedial measures to be implemented. Should the overall concentration of lead returned by these samples be similar to that of BH2 @ 0.5mbgl (i.e. >462mg/kg) then measures as discussed in Section 1.3.1 for Sensitive End Use areas should be implemented (e.g. installation of 130mm clean cover).

If as a result of these works there was a shortfall of near surface soils thus necessitating the importation of additional suitable soils onto the site, these will be certified as fit for purpose through an appropriate programme of testing prior to delivery to the site.

2.2 Previously Unidentified Contamination

If during any excavation associated with the development, sources of potential contamination or materials previously unidentified (e.g. those of an unusual appearance and/or odour etc.) be encountered works will be halted in that area, the local planning authority informed and the advice of a geo-environmental specialist sought to determine an appropriate course of action, which would need to be agreed with the local planning authority.

2.3 Closure Report

A closure report documenting the works undertaken will be compiled and submitted to the local planning authority at the conclusion of the works. This will include the following:-

- Documentation of any materials removed from site (e.g. waste transfer notes etc.) including photographic evidence.
- Visual assessment of the base of areas proposed for landscape planting.
- Validation testing of rear garden soils for total lead.
- Verification testing of any soils proposed for importation onto the site.
- Closure report, summarising the works undertaken.

2.4 Regulatory Approval

We would recommend that formal approval be sought from the local planning authority and/or the agency with regards to the conclusions, recommendations and/or scope and extent of remedial and validation measures detailed within the recommendations contained in this report prior to commencing with any development at the site.



3.0 LIMITATIONS AND USE OF THIS REPORT

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions set out in this report.

- a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Terragen Environmental Consultants Limited (TGEN) to act as a consultant.
- b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
- c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
- d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, TGEN has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
- e) TGEN acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. TGEN will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, TGEN shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
- f) The content of this report represents the professional opinion of experienced environmental consultants. TGEN does not provide specialist legal advice and the advice of lawyers may be required.
- g) In the Summary and Recommendations sections of this report, TGEN has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by TGEN and therefore any advice, opinions or recommendations set out in the Executive Summary, Summary and Recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
- h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
- i) There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.
- j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by TGEN for inaccuracies within the data supplied by other parties.
- k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
- I) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
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Figure 1 Existing Site Plan

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21/12/09 Revision in response to L.A. comment





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Figure 2 Proposed Site Plan



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Figure 3 Proposed Cross Section Plan



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