esi consulting

Applied Environmental Insight

26 Lower Merton Rise: Basement Impact Assessment Additional Works

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Prepared for

Kasia Whitfield
R&K Systems Ltd
By email only

Report reference:
62274.00.01R2Rev1, July 2017

Report status:
FINAL

CONFIDENTIAL
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26 Lower Merton Rise: Basement Impact Assessment Additional Works

This report has been prepared by ESI Ltd. (ESI) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client, and is provided by ESI solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to ESI at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, ESI may, by prior written agreement, agree to such release, provided that it is acknowledged that ESI accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. ESI accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against ESI except as expressly agreed with ESI in writing.

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Reviewed by (Groundwater)	Joe Gomme (C.Geol)	

Revision record:

Issue	Date	Status	Comment	Author	Checker	Reviewer
1	July 2017	Final	-	MPS	HCV	JWG/HCV
2	July 2017	Final	Included updated development plans	MPS	JEM	JWG/HCV
3						
4						

Impact summary

The assessment findings are summarised as follows:

1. Impacts to surface water flows and related flooding	High	
	Med	
	Low	
2. Impacts to ground water flows and related flooding	High	
	Med	
	Low	
3. Overall risk posed by the Site	High	
	Med	
	Low	

Key:

High		*There is a high potential risk*
Med		*There is medium potential risk*
Low		*There is a low potential risk*

Summary

Based on the Site-specific data reviewed and the additional works carried out, it is considered that the proposed basement extension will not cause significant impacts to the surface water and groundwater regimes at the Site.

There are no surface water courses within 500 m of the Site and the overall impermeable surface area will remain the same. Therefore, potential flood risk to adjacent and downstream properties will not increase and it is considered that no mitigation measures are required with respect to surface water runoff.

Whilst groundwater was recorded during the post-investigation monitoring round and throughout the additional works, the data suggest that it is not representative of a groundwater table. Therefore, the proposed development is not expected to have any impact on the water table or groundwater flow. Based on this no mitigation measures are required to maintain groundwater levels or flow. During works a sump and pump arrangement will be able to manage the removal of small volumes of incidental water.

A cumulative assessment has also been undertaken which has identified basements in neighbouring properties. However, given the nature of the underlying strata and the absence of a groundwater table no cumulative impacts are expected. Therefore, no mitigation measures are required.

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1 Introduction

1.1 Instruction

ESI Ltd. (ESI) was commissioned by Kasia Whitfield (the Client) to undertake additional monitoring in the two existing boreholes at 26 Lower Merton Rise, London, NW3 3SP (the Site). Instruction to proceed in accordance with ESI terms outlined by email dated 30th May 2017 was received via email dated 1st June 2017.

1.2 Background

The Site is located in the jurisdiction of the London Borough of Camden (the Council) and comprises a three-storey mid-terrace home. A Basement Impact Assessment (BIA) carried out by ESI Ltd in January 2015 was included as part of the planning application submitted in 2015. Planning permission (2013/7042/P) was granted subject to conditions on 13th April 2015 for the erection of a single storey rear extension, excavation of a basement under the proposed extension and the replacement of rear windows and the garage door. This report has been written pursuant to Condition 6 which notes:

> *"No development shall take place until details have been submitted to and approved in writing by the local planning authority in relation to the final design and construction of the basement including further tests and monitoring of groundwater, as recommended in paragraph 5.2 of the approved Basement Impact Assessment (ref 62274R1 dated January 2015 by ESI Ltd), to mitigate any potential negative impact to groundwater flow. The development shall be carried out in accordance with the approved details"*

The planning decision notice is included in Appendix A and the Basement Impact Assessment (ref 62274R1) carried out by ESI Ltd in January 2015 is included in Appendix B.

Updated development plans were provided by the client in July 2017 which are presented in Appendix C. The plans show a minor alteration to the original plans submitted within the 2015 BIA (ref 62274R1). The alteration is to the rear of the house and includes the addition of a small lightwell to the basement however this will not change the area of hardstanding on Site. Therefore the results of our work are not affected by the updated development plans.

1.3 Scope of works

The requested scope of works includes an assessment of the water detected in the onsite boreholes and the determination of the source of this water. This assessment was conducted by initially purging each well and monitoring the wells for the following four hours as the water level recovered. This was followed by two further weekly monitoring rounds. This report presents the data obtained during the assessment and provides suitable recommendations for groundwater control during works (if required).

1.4 Limitations

The information contained in this report is intended for the use of the Client and no responsibility can be taken by ESI for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.

2 Site information

2.1 Site details

The Site location is shown in Figure 1 and Table 2.1 summarises the key Site details.

Table 2-1 Site details

Site address	26 Lower Merton Rise, London, NW3 3SP
Site elevation	Approximately 51 m AOD
Geology	Superficial: Not present on Site Bedrock: London Clay Formation (Figure 2)
Hydrology	No surface water courses within 500 m of the Site. A 'lost river' is noted 50 m west of the Site.
Hydrogeology	Unproductive strata (low permeability layer with negligible significance for water supply or river base flow)
Surrounding basements	The nearest basement to the Site is located at 13 Lower Merton Rise at a distance of 46 m.
2015 BIA (inclusive of 2014 Site investigation)	Fieldwork: Two window sample boreholes, WS1 (rear) and WS2 (front), were completed on 23rd October 2014. WS1 was installed to 4.8 m bgl with the top 1.6 m plain pipe and sealed with bentonite. WS2 was installed to 4.9 m bgl with the top 1.9 m plain pipe and sealed with bentonite. Both installations used 5 cm wells with gas bungs and were installed approximately 0.1 m bgl. Engineering logs are included in Appendix D. Ground conditions: Average of 1.23 m of Made Ground underlain by London Clay (depth not proven as part of this investigation). Silty sandy pockets were noted in WS1 and WS2 at 2.8 and 2.3 m, respectively. Groundwater: No groundwater encountered during Site works Groundwater monitoring: Recorded at variable depths between 1.8 and 2.6 m in each borehole over two return monitoring visits. Conclusions: The collated data from the desk study and original Site investigation indicate that no groundwater would be present on Site. However, the follow on monitoring recorded the presence of groundwater and the source of water is unknown.

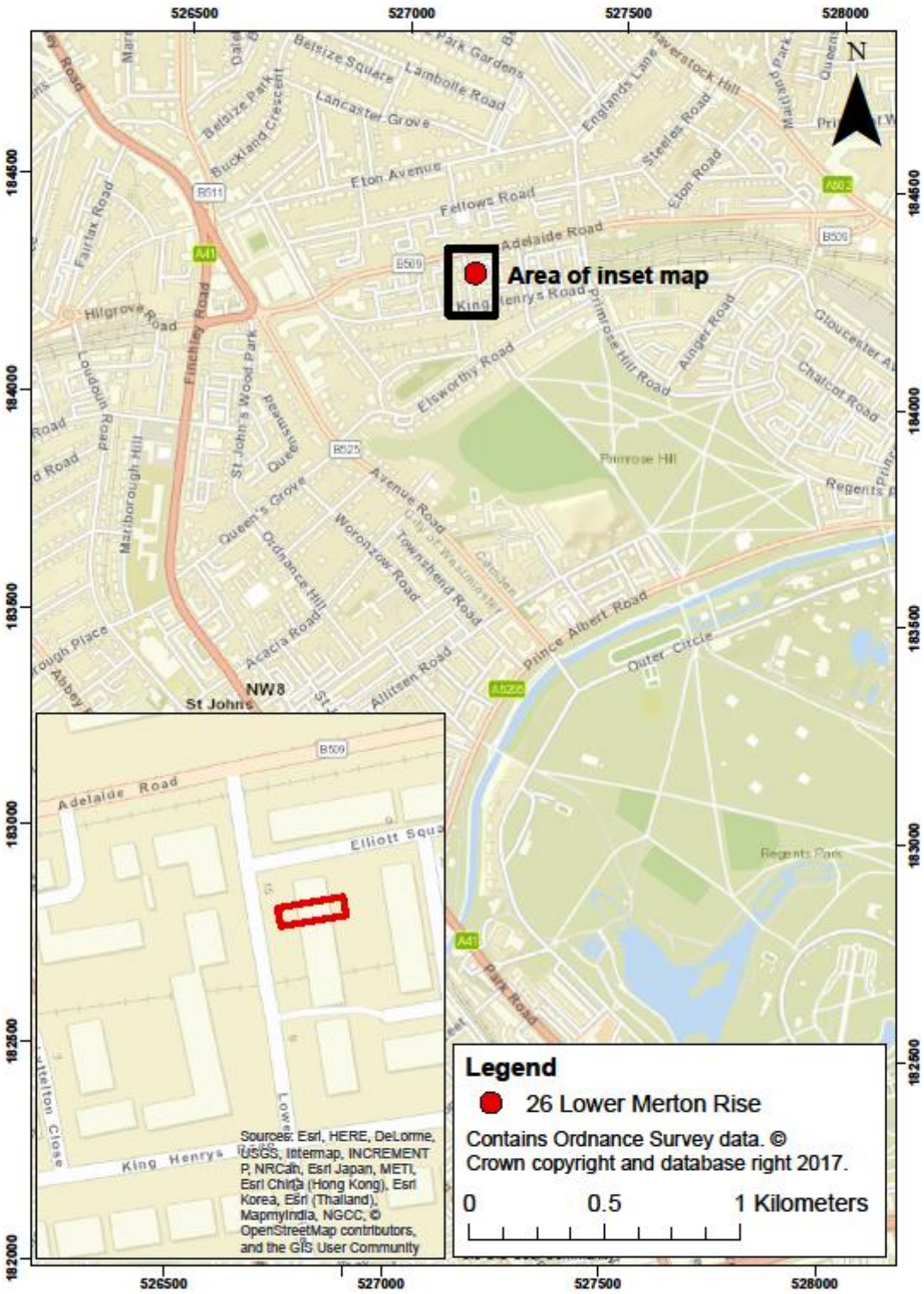

Figure 1 Site location

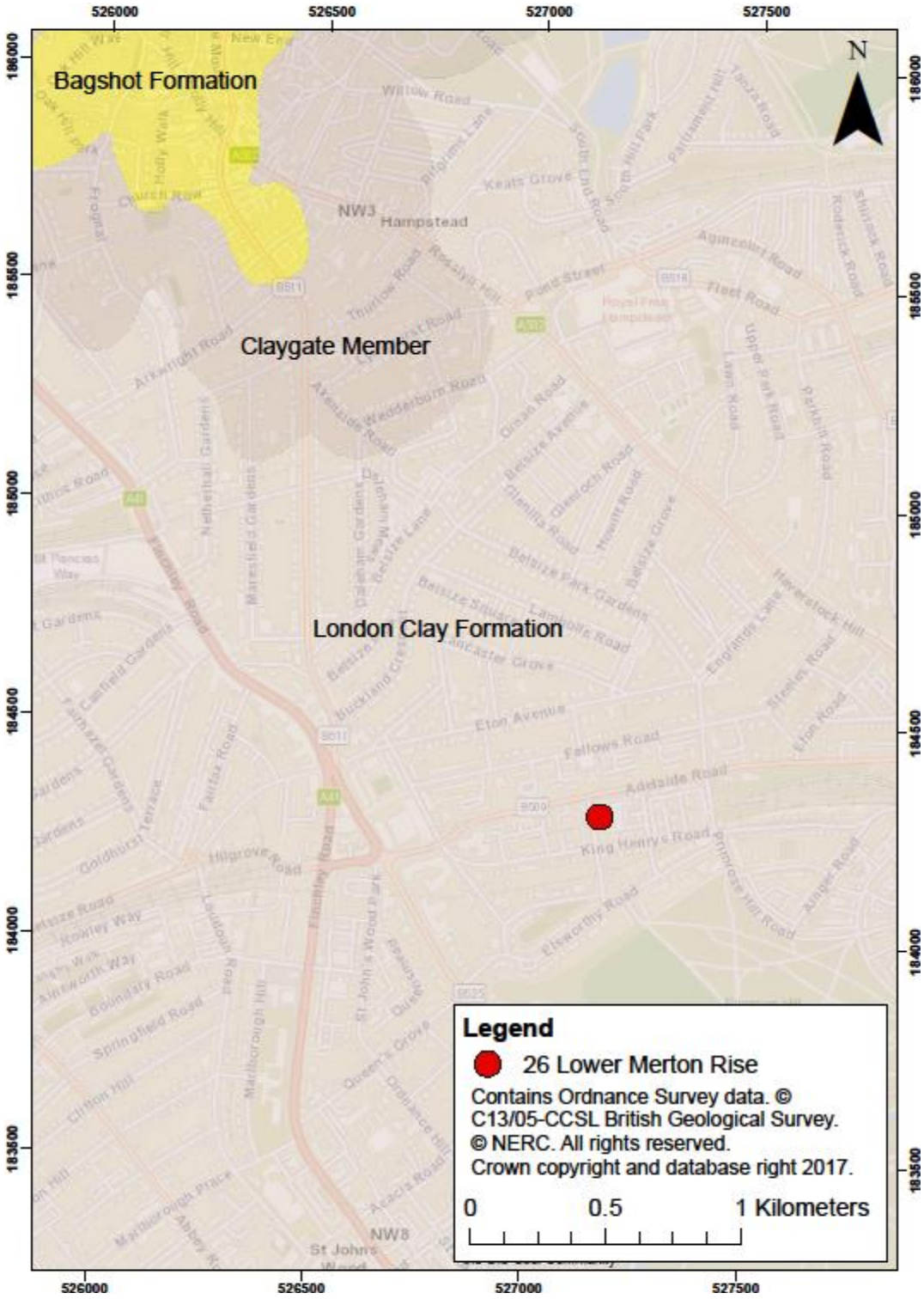

Figure 2 Bedrock geology

3 Additional works

The aim of the additional works was to identify the source of the water within the on-Site boreholes and to determine the re-charge rates and possible implications.

3.1 Well purging and monitoring

Each of the two boreholes on site (WS1 and WS2) was purged on 8th June 2017 using standard flow Waterra tubing and a D-25 foot valve as the boreholes were too narrow to use a standard bailer. The groundwater depth was recorded prior to purging, immediately after purging and then monitored for the following 4 hours to determine the recharge rate. Table 3-1 and Table 3-2 summarise the collected data from the initial monitoring rounds in 2014 and the monitoring data from the additional works. Results are displayed in Section 3.1.1.

Table 3-1 Summary of groundwater depths

BH	1st monitoring round (31/10/14) (m bgl)	2nd monitoring round (07/11/14) (m bgl)	Prior to purging (m bgl)	After purging (m bgl)	After 4 hours (m bgl)	1st monitoring round (15/06/17) (m bgl)	2nd monitoring round (26/06/17) (m bgl)
WS1	2.6	2.1	1.44	4.69	4.26	1.87	1.46
WS2	2.6	1.8	1.23	4.74	3.89	1.30	1.44

Table 3-2 Summary of groundwater drawdown after purging

BH	Purged volume (L)	Initial drawdown after purging (m)	Total recovery after 4 hours (m)
WS1	25.5	3.25	0.43
WS2	27.6	3.51	0.85

3.1.1 Rising head test results

Rising head tests were carried out in WS1 and WS2 following the Hvorslev method (1951). This method involves the sudden removal of water and subsequent monitoring of the water level recovery. Figures 3 and 4 show the recovery response of each borehole over 4 hours and the complete purging results are included in Appendix E.

This test was undertaken to determine the recharge rates and Figures 3 and 4 clearly show a slow response over 4 hours. Because of this, the recharge rate in each borehole is not considered to be notable and no further analysis is required.

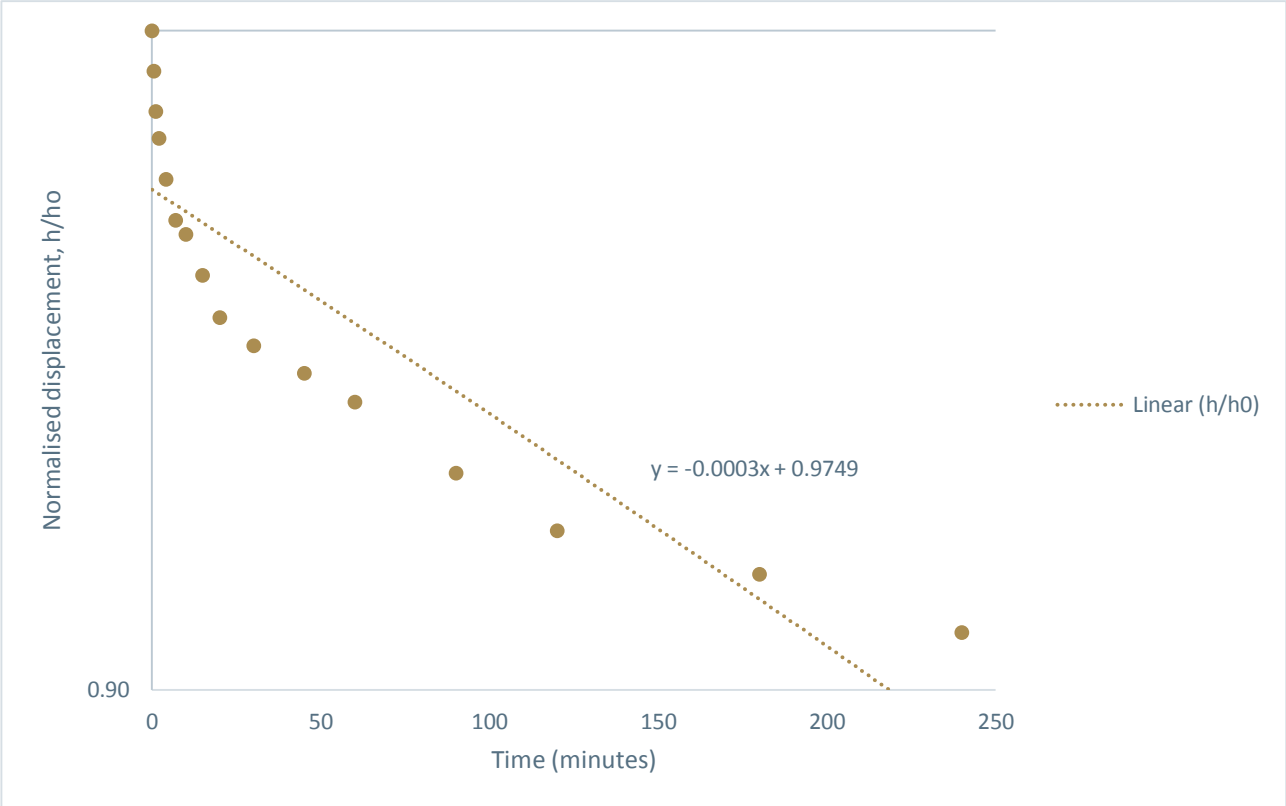

Figure 3 WS1 – Normalised displacement vs Time

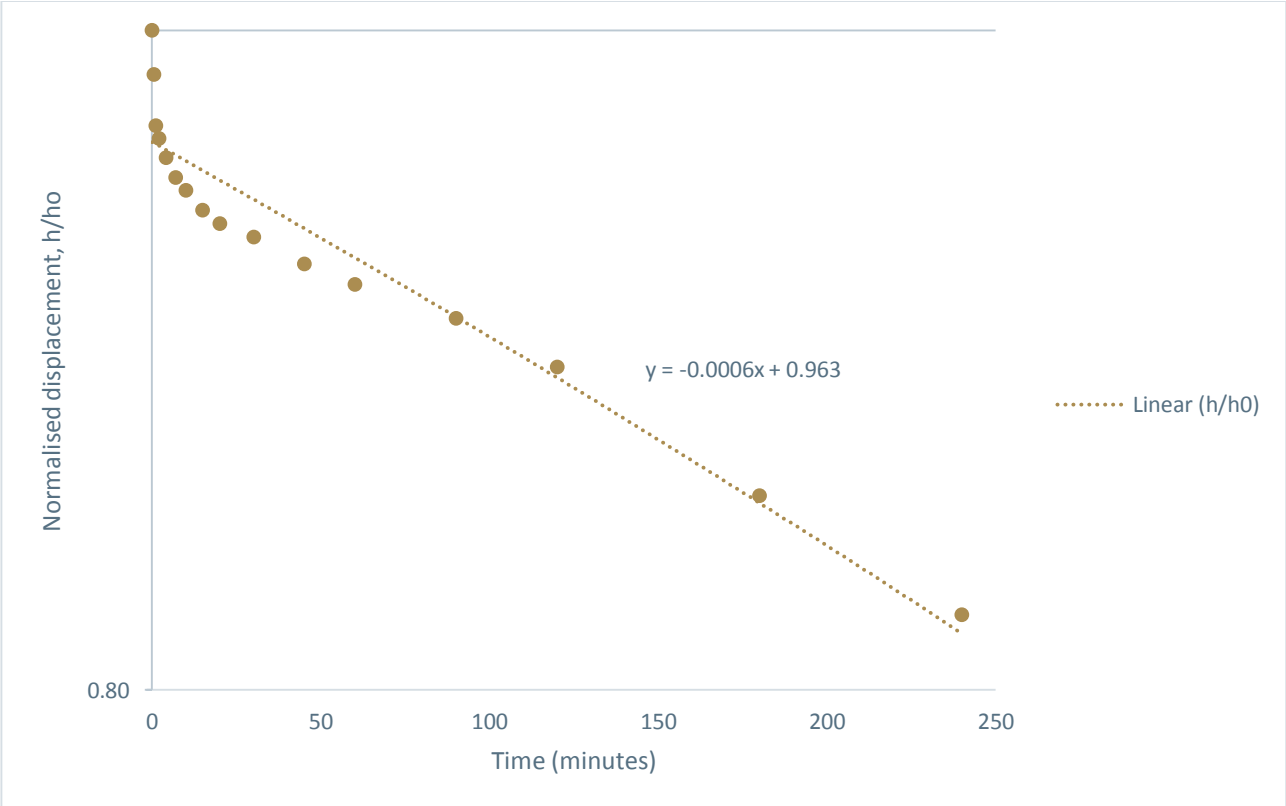

Figure 4 WS2 – Normalised displacement vs Time

3.2 Discussion of results

Precipitation data from the Heathrow raingauge was recorded for the month of June. Rainfall was below average for June with 0 mm of precipitation recorded between monitoring rounds. Some precipitation was recorded the week prior to the initial monitoring round and included; 7.0 mm on 2nd June, 0.2 mm on 5th June, 16.0 mm on 6th June, 0.8 mm on 7th of June and 0.2 mm on 8th June which was the day of the first monitoring round (Met Office, 2017).

The groundwater levels recorded prior to purging were higher than those recorded in the two follow on monitoring rounds. This was likely due to rainfall the week prior to the initial groundwater depth recorded. The first monitoring round recorded the lowest groundwater level which suggests that the boreholes were still recovering from the purging which occurred one week prior. However, the recovery recorded is limited and variable between the two wells which indicates that the water is not representative of a true groundwater table.

The installation of each well (including the gas bung) was approximately 0.1 m bgl (each below brick paving) which remained uncovered over the duration of the additional works. These depressions could have acted as a possible sump for small amounts of surface water runoff with water potentially leaking in to each borehole.

3.3 Conclusions

The recovery rates recorded in the rising head tests are representative of a non-response or limited response which corresponds to a material of very low permeability. The groundwater monitoring results are variable both between wells and also between monitoring visits which indicates that the water is not representative of a true groundwater table.

During the original Site investigation, silty layers and sandy pockets had been noted at 2.8 m and 2.3 m in WS1 and WS2, respectively, which is within the screened section of each well. All groundwater depths recorded were below the surface of the London Clay Formation which confirms that it does not comprise a perched groundwater table overlying the unproductive strata. However, the anisotropic nature of the upper boundary of the London Clay and the granular layers noted in the boreholes indicate that pockets of higher permeability may be present below the property. These silty sandy pockets may be water-bearing but are not hydraulically connected to an aquifer.

Precipitation in June was below average with no rainfall recorded between monitoring rounds. However, as precipitation was recorded the week prior to the initial monitoring it is possible that the water percolated through the London Clay which may account for the recovery noted in each borehole during the first monitoring round. Therefore, surface water runoff or small quantities of rainwater infiltrating the Made Ground is the probable source of water within each borehole.

4 Updated impact assessment

4.1 Introduction

This impact assessment considers the information reviewed as part of the Screening and Scoping stages from the BIA issued in January 2015 and considers the additional works carried out in June 2017. Site-specific information is utilised including the results of the Site investigation and the additional groundwater monitoring in order to draw final conclusions.

4.2 Surface water impacts

The Site is located within Flood Zone 1 as defined by the EA and is therefore at negligible to low risk from flooding from all sources. There are no surface water features within 500 m of the Site. A tributary of the 'lost river' Tyburn runs north-south approximately 50 m west of the Site; however it is not considered likely that there will be any resulting impact on the quantity or quality of the surface water runoff received by this 'lost watercourse'. Furthermore, the proposed development will not alter the area of hard standing at the Site.

Therefore, the proposed development is not expected to impact surface water flows or increase the risk of flooding to adjacent properties.

4.3 Groundwater impacts

The additional works confirmed the water present in the boreholes is unlikely to be representative of a groundwater table. The fluctuations noted are likely due to incidental water from surface water runoff or from limited shallow infiltration into the Made Ground. The pathway of the surface water could be from the borehole depressions acting as a sump or from the accumulation of water in the sandy layers and then draining into the boreholes over time. The nature of the London Clay Formation and the very slow recharge recorded during the rising head tests support the conclusion that the proposed development will not generate significant cumulative impacts or have an impact on the existing neighbouring basements. Therefore, the proposed development is not expected to have any impact on groundwater levels or flow.

5 Conclusions

Potential hydrological and hydrogeological impacts of the proposed development at 26 Lower Merton Rise, London, NW3 3SP have been considered in accordance with the Planning Guidance produced by the Council. Based on the information available and the additional works carried out, the following summary conclusions are made.

- The Site is not at risk of flooding from any sources.
- There are no surface water courses within 500 m and the nearest lost river is 50 m to the west; however, given the nature of the shallow geology it is unlikely to be impacted by the development.
- The proposed development will not increase the impermeable surface area of the Site. Therefore, it is considered that overall runoff and related flooding risk from the proposed development will remain the same.
- The Site investigation (2014) and additional works (2017) identified water within the exploratory positions; however, the additional works identified the water as likely being due to incidental surface water and not representative of a groundwater table. Therefore, the proposed development is not expected to have a significant impact on groundwater levels or flow and risk is considered to be negligible.
- Whilst adjacent basements/ lower ground floors exist beneath surrounding properties, due to the lack of identified groundwater these are unlikely to be affected by the proposed basement extension since potential changes to groundwater flow and elevation are not envisaged.
- The lack of recharge noted and the variable water levels identify the potential requirement for the removal of small volumes of water during works. A sump and pump arrangement will be able to manage the removal of small volumes of incidental water however will likely not be required to operate at all times.

6 References

Barton, N., 1992. The Lost Rivers of London, revised edition. Historical Publications Ltd. London.

British Geological Survey, 2017. Retrieved July 2017 from http://mapapps.bgs.ac.uk/geologyofbritain/home.html.

Camden Council, 2013. Camden Planning Guidance: Basements and lightwells. London Borough of Camden, CPG4.

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Hvorslev, M.J., 1951. Time lag and soil permeability in groundwater observations. U.S. Army Corps Engineers. Waterways Experiment Station. Bulletin 36, Vicksburg, Mississippi.

London Borough of Camden. Camden Regeneration and Planning Development Management. Decision Letter 2013/7042/P. April 2015.

Met Office, 2017. Retrieved June 2017 from http://www.metoffice.gov.uk/

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APPENDICES

APPENDIX A

Planning permission decision 2013/7042/P

Regeneration and Planning
Development Management
London Borough of Camden
Town Hall
Judd Street
London
WC1H 8ND

Tel 020 7974 4444
Textlink 020 7974 6866

planning@camden.gov.uk
www.camden.gov.uk/planning

Mrs Kasia Whitfield
R & K Systems Ltd
Garden Flat
90 Fellows Road
Belsize Park
London
NW3 3JG

Application Ref: **2013/7042/P**
Please ask for: **Olivier Nelson**
Telephone: 020 7974 **5142**

13 April 2015

Dear Sir/Madam

DECISION

Town and Country Planning Act 1990 (as amended)

Householder Application Granted

Address:
26 Lower Merton Rise
London
NW3 3SP

Proposal:
Erection of a single storey rear extension, excavation to provide basement under proposed extension, replacement windows at first floor level to rear and replacement of garage door with a window to front elevation of single dwelling house (Class C3).

Drawing Nos: LMR26/2-EX0, LMR26-EX1, LMR26-EX2, LMR26-EX3, LMR26-EX4, LMR26/2-PP1, LMR26/2-PP2, LMR26/2-PP3, LMR26/2-PP4, LMR26/2-PP5,LMR26/2-PP6, Basement Impact Assessment ref 62274R1 dated January 2015 by ESI ltd, Environmental Assessment Construction Method Statement ref L13/097/10

The Council has considered your application and decided to grant permission subject to the following condition(s):

Condition(s) and Reason(s):

1 The development hereby permitted must be begun not later than the end of three years from the date of this permission.

Reason: In order to comply with the provisions of Section 91 of the Town and Country Planning Act 1990 (as amended).

2 All new external work shall be carried out in materials that resemble, as closely as possible, in colour and texture those of the existing building, unless otherwise specified in the approved application.

Reason: To safeguard the appearance of the premises and the character of the immediate area in accordance with the requirements of policy CS14 of the London Borough of Camden Local Development Framework Core Strategy and policy DP24 of the London Borough of Camden Local Development Framework Development Policies.

3 The development hereby permitted shall be carried out in accordance with the following approved plans LMR26/2-EX0, LMR26-EX1, LMR26-EX2, LMR26-EX3, LMR26-EX4, LMR26/2-PP1, LMR26/2-PP2, LMR26/2-PP3, LMR26/2-PP4, LMR26/2-PP5,LMR26/2-PP6, Basement Impact Assessment ref 62274R1 dated January 2015 by ESI ltd, Environmental Assessment Construction Method Statement ref L13/097/10.

Reason:
For the avoidance of doubt and in the interest of proper planning.

4 Construction Management Statement (CMS)

Details of the Construction Management Statement will relate to the scale and kind of the development, however, in terms of assessing the impact on transport the plan should demonstrate that the following has been considered and where necessary the impacts mitigated:

(Note the term 'vehicles' used here refers to all vehicles associated with the implementation of the development, e.g. demolition, site clearing, delivering of plant & material, construction etc.)

a) The access arrangements for vehicles.
b) Details (including accurate scaled drawings) of any highway works necessary to enable construction to take place.
c) Parking and Loading arrangement of vehicles and delivery of materials and plant to the site.
d) Details of proposed parking bays suspensions and temporary traffic management orders.
e) Details of security hoarding required on the public highway
f) The proposed site working hours including start and end dates.
g) Details of any other measure designed to reduce the impact of associated traffic (such as the use of construction material consideration centres, measures to control dust and dirt and schemes for recycling/disposal of waste from demolition).
h) Any other relevant information.
i) The CMS should also include the following statement:

"The agreed contents of the Construction Management Statement must be complied with unless otherwise agreed with the Council. The project manager shall work with the Council to review this Construction Management Statement if problems arise in relation to the construction of the development. Any future revised plan must be approved by the Council and complied with thereafter."

It should be noted that any agreed CMS does not prejudice further agreement that may be required for things such as road closures or hoarding licences.

Reason: To avoid obstruction of the surrounding streets and site and to safeguard amenities of adjacent premises in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policy DP21 of the London Borough of Camden Local Development Framework Development Policies.

5 No part of the flat roof area hereby approved shall be used as a roof terrace, and any access shall be for maintenance purposes only.

Reason: In order to prevent any detrimental impacts of overlooking and/or noise and disturbance of the neighbouring premises in accordance with the requirement of policy CS5 (Managing the impact of growth and development) of the London Borough of Camden Local Development Framework Core Strategy and policy DP26 (Managing the impact of development on occupiers and neighbours) of the London Borough of Camden Local Development Framework Development Policies.

6 No development shall take place until details have been submitted to and approved in writing by the local planning authority in relation to the final design and construction of the basement including further tests and monitoring of groundwater, as recommended in paragraph 5.2 of the approved Basement Impact Assessment (ref 62274R1 dated January 2015 by ESI Ltd), to mitigate any potential negative impact to groundwater flow. The development shall be carried out in accordance with the approved details.

Reason: To safeguard the local hydrogeological environment, the structural stability of neighbouring buildings and the character of the immediate area, in accordance with the requirements of policy CS14 of the London Borough of Camden Local Development Framework Development Policies and policies DP23 and DP27 of the London Borough of Camden Local Development Framework Development Policies.

Informative(s):

1 Reason for granting permission

The basement extension extends below the proposed single storey rear extension. The basement would be used as a Utility Room. A full Basement Impact Assessment was submitted with the planning application. It was considered that there is a very low risk of surface water flooding at the site. The basement extends

a maximum of 3.5m below ground floor level. The lost river Tyburn is approximately 10m west of the application site, however the proposed depth of the basement is not consider to impact on the quantity or quality of the surface run-off received by this watercourse. The assessment concluded that the proposal would not have a significant impact on groundwater levels. The proposed basement would be accommodated wholly below the proposed single storey rear extension therefore the proposal would not have any impact on the amenity of adjoining or nearby occupiers by way of loss of light, sense of enclosure, loss of outlook or, loss of privacy.

The proposed single storey rear extension is subordinate in scale and location to the host building and is of an appropriate design by virtue of the materials proposed. The extension area would provide additional living space. The proposal would extend up to the boundary at no. 24 and 28 Lower Merton Rise. The proposed depth of 3.9m is considered acceptable for a single storey rear extension and this is not considered to be detrimental to the neighbouring properties.

The proposed changes at lower ground and ground floor level are not considered to impact on the character or appearance of the host building, or the street scene given that the proportions are of an appropriate size and are to be located on a façade not readily visible from the wider public realm.

6 neighbours were consulted and one objection has been received and duly taken into account prior to making this decision. The site's planning history was taken into account when coming to this decision.

As such, the proposed development is in general accordance with policies CS5 and CS13 of the London Borough of Camden Local Development Framework Core Strategy, and policies DP22, DP23, DP24, DP26 and DP27 of the London Borough of Camden Local Development Framework Development Policies. The proposed development also accords with policies 5.13, 7.4, and 7.6 of the London Plan 2011; and paragraphs 14, 17, and 56 -66 of the National Planning Policy Framework.

2 Your proposals may be subject to control under the Building Regulations and/or the London Buildings Acts which cover aspects including fire and emergency escape, access and facilities for people with disabilities and sound insulation between dwellings. You are advised to consult the Council's Building Control Service, Camden Town Hall, Argyle Street WC1H 8EQ, (tel: 020-7974 6941).

3 Noise from demolition and construction works is subject to control under the Control of Pollution Act 1974. You must carry out any building works that can be heard at the boundary of the site only between 08.00 and 18.00 hours Monday to Friday and 08.00 to 13.00 on Saturday and not at all on Sundays and Public Holidays. You are advised to consult the Council's Compliance and Enforcement team [Regulatory Services], Camden Town Hall, Argyle Street, WC1H 8EQ (Tel. No. 020 7974 4444 or on the website http://www.camden.gov.uk/ccm/content/contacts/council-contacts/environment/contact-the-environmental-health-team.en or seek prior approval under Section 61 of the Act if you anticipate any difficulty in carrying out construction other than within the hours stated above.

4 Your proposals may be subject to control under the Party Wall etc Act 1996 which covers party wall matters, boundary walls and excavations near neighbouring buildings. You are advised to consult a suitably qualified and experienced Building Engineer.

In dealing with the application, the Council has sought to work with the applicant in a positive and proactive way in accordance with paragraphs 186 and 187 of the National Planning Policy Framework.

You can find advice about your rights of appeal at:

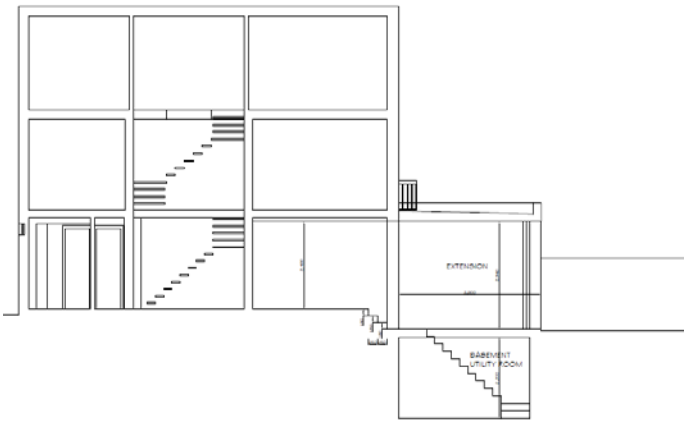
http://www.planningportal.gov.uk/planning/appeals/guidance/guidancecontent

Yours faithfully

Ed Watson
Director of Culture & Environment

APPENDIX B

26 Lower Merton Rise: Basement Impact Assessment, ESI Ltd, January 2015



Basement Impact Assessment: 26 Lower Merton Rise

(Surface Water and Groundwater)

Basement Impact Assessment: 26 Lower Merton Rise

Prepared for

Richard Max
26 Lower Merton Rise
LONDON
NW3 3SP

Report reference: 62274R1, January 2015
Report status: Final

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Registered office: New Zealand House, 160 Abbey Foregate, Shrewsbury, SY2 6FD. Registered in England and Wales, number 3212832

Basement Impact Assessment: 26 Lower Merton Rise

This report has been prepared by ESI Ltd. (ESI) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client, and is provided by ESI solely for the internal use of its client.

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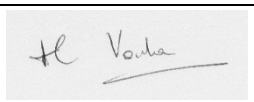
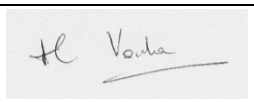
62274R1. Final

Surface Water

	Name	Signature
Author	Henry Kelly	
Checked by	Helen Vonka (CIWEM)	
Reviewed by	Helen Vonka (CIWEM)	

Groundwater

	Name	Signature
Author	Henry Kelly	
Checked by	Joe Gomme (CGeol)	
Reviewed by	Joe Gomme (CGeol)	

Revision record:

Issue	Report ref	Comment (SW/GW)	Author	Checker	Reviewer	Issue date	Issued to
1	62274R1D1	SW & GW	HJK	HCV	JWG	09/01/2015	Richard Max and Kasia Whitfield
2	62274R1	SW & GW	HJK	HCV	JWG	09/01/2015	Richard Max and Kasia Whitfield
3							
4							

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Prepared by
ESI Ltd

New Zealand House,160 Abbey Foregate, Shrewsbury, SY2 6FD, UK
*Tel +44(0)1743 276100 Fax +44 (0)1743 248600 email **info**@esinternational.com*

REPORT SUMMARY

The assessment findings are summarised as follows:

1. Impacts to surface water flows and related flooding	High	
	Med	
	Low	
2. Impacts to ground water flows and related flooding	High	
	Med	
	Low	
3. Overall risk posed by the Site	High	
	Med	
	Low	

Key:

High		*There is a high potential risk*
Med		*There is medium potential risk*
Low		*There is a low potential risk*

RECOMMENDATIONS (FOR NEXT STEPS)

The development described in this report will cause no change in impermeable surface area. Therefore, it is considered that peak run-off and related flooding risk from the proposed development will not change and there is no action required to mitigate detrimental changes to Site run-off.

The presence of groundwater cannot be established with the available information.

The water detected in the onsite boreholes may be from surface water, in which case there is a low potential risk and no action would be required to mitigate impacts of the proposed development on groundwater.

The water detected in the onsite borehole may be groundwater in the London Clay. If there is groundwater present then there is a low to medium potential risk to the proposed basement construction, which can be mitigated by appropriate design and construction techniques.

It is recommended that, prior to the decision on design and construction techniques, the source of the water detected in the onsite borehole is established.

CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Background

ESI Ltd (ESI) was commissioned by Richard Max in April 2014 to undertake a Basement Impact Assessment (BIA) for the proposed development at 26 Lower Merton Rise, London, NW3 3SP (the Site). This is a mid-terrace three-storey house located at the approximate national grid reference of 527271 184240 in the London Borough of Camden (Figure 1.1)

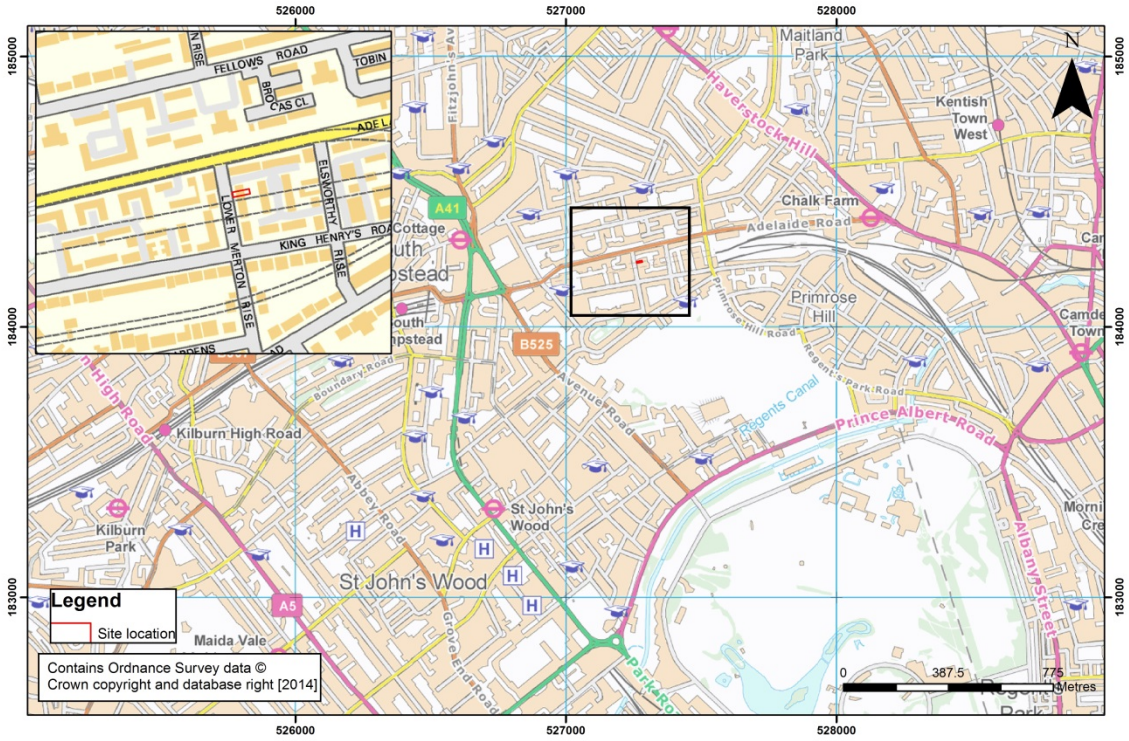

Figure 1.1 Site Location

This document is a desk study which considers the potential impact relating to the proposed basement development in terms of surface water and groundwater flow and flooding and complies with guidance issued by the London Borough of Camden. This report will be used for submission to the Planning Authority for approval of the proposed development.

1.2 Scope of Works

The following scope of works was requested: an assessment of the impacts of the proposed development on surface water and groundwater flow, levels and drainage. This report outlines the hydrological and hydrogeological conditions with relevance to construction of the basement at the property. The assessment conforms to the requirements of guidance set out by The London Borough of Camden which provides comprehensive guidance on planning applications for basement extensions. These guidelines for basement impact assessments (Arup (2010), Camden Borough Council, (2013)) have been consulted in order to complete a screening analysis of key hydrological and hydrogeological issues that will satisfy the relevant planning requirements.

The works undertaken follow the procedure outlined below:

1) Screening – this process aims to identify sites that are a priority for investigation.
2) Scoping – this process uses simple calculations to try to demonstrate whether the potential hazards identified in the screening stage pose a risk as a result of the development, and whether the actual risk is significant.
3) Site conceptualisation and impact assessment
4) Recommendations

1.3 Proposed Basement Works

The proposed development is for the excavation of a new single-storey basement for a residential property below a proposed new extension to the rear of the building. Site plans are shown in (Appendix A).

The depth of the completed basement is expected to be 3.5 m below ground level. The ground level at the front of Site is estimated to be 51 metres above Ordnance datum (mAOD) based upon Ordnance Survey mapping data; this is the value quoted as being "ground level" for the purposes of this report. Across the Site, the surface elevation drops approximately 0.60 m from the front to the rear as is evident on the site plans.

The basement will have an external area of approximately 23.6 m^2. The full extent of the proposed basement will be below the footprint of the existing above-ground construction so there will be no increase in impermeable surface area.

2 SCREENING

The screening stage for Impact Assessment has been considered as set out in CPG4 (Camden Council, 2013) as follows.

2.1 SURFACE WATER (Surface flow and flooding screening flowchart (Figure 3, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
1) Is the site within the catchment of the pond chains on Hampstead Heath?	**No**	The site is not within the catchment of the ponds on Hampstead Heath.	Arup, 2010. Ordnance Survey Mapping.
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?	**No**	There are no known plans to change the site drainage from its current configuration. As the basement will be confined beneath the footprint of the existing above-ground structure, there would be no change to the site run-off regime resulting from the proposed development.	Site Plans.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**No**	The proposed basement will be beneath the footprint of the existing building.	Site Plans.
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?	**No**	As there is no change in the proportion of impermeable surfaces on the Site, there is not expected to be any change in surface water quantity leaving the Site.	Site plans.
5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**Potentially**	The culverted tributary of the “lost” river Tyburn runs west of the Site from north to south at an approximately equal elevation. It is thought that this river runs beneath Lower Merton Rise itself within 10 m of the Site boundary. It is most likely that the Site falls within the catchment of this underground watercourse; however, the size and nature of the proposed development suggests it is highly unlikely to impact on the quality of this watercourse, or the receiving waters of adjacent properties. During construction works there may be some additional suspended solids contained within run-off entering the watercourse as might be expected to result from all significant construction projects; the extent of this is considered to be temporary and of low significance.	Ordnance Survey Mapping. Barton, 1992. Arup, 2010.

6) Is the Site in an area known to be at risk from surface water flooding 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?	**No**	Lower Merton Rise is not a road which has previously experienced surface water flooding nor is it at risk from surface water flooding according to Arup (2010). However, historically in 1975 there has been flooding on the nearby streets of Fellows Rd 145 m to the north and Winchester Rd 330m to the west. More recently in 2002 there has been flooding on Primrose Hill road 130 m to the east (Arup, 2010). The Site is at a very low risk of surface water flooding and there is very low risk of flooding from rivers and reservoirs as defined by the Environment Agency (2014).	Arup, 2010. Environment Agency, 2014

2.2 GROUND WATER (Subterranean (ground water) flow screening chart (Figure 1, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
1a) Is the Site located directly above an aquifer?	**No**	The Site is located upon the London Clay Formation; a sedimentary bedrock comprising bioturbated or poorly laminated, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. This may contain high porosity, low permeability horizons within generally low permeability and low porosity material that is classified as Unproductive Strata by the Environment Agency. The closest borehole log TQ28SE2011 (132 m northeast of the site) shows that locally the London Clay has thicknesses in excess of 24.4 m (Appendix B). There is between 1.20 m and 1.25 m of Made Ground overlying the London Clay; this was logged during the ground investigation undertaken by Soil Consultants on October 2014 (Appendix C). Soil Consultants found the London Clay to be firm to stiff clay with rare pockets of sand.	British Geological Survey, 2014. Soil Consultants, 2014
1b) Will the proposed basement extend beneath the water table surface?	**Uncertain**	Given the nature of the London Clay in the vicinity of the Site significant groundwater movement in the London Clay beneath the Site is unlikely. No water strikes were reported during the drilling of the boreholes to 5 m depth during the ground investigation (Appendix C). Water level monitoring that has been undertaken at the Site recorded a water level in the boreholes averaging 2.12 mbgl over an 18 day period (31/10/2014 - 18/11/2014). The source of this water is uncertain. Soil Consultants (the installers of the boreholes) state that the bentonite installed in the annulus between the borehole casing and the wall of the drilled hole takes time to properly hydrate and form a seal around the pipe; it is considered that water may have reached the borehole screen over this time from the surface or near surface (email Alan Watson, 1st December 2014).	British Geological Survey, 2014. Soil Consultants, 2014

2) Is the Site within 100m of a watercourse, well (used/disused) or potential spring line?	**Yes**	The culverted ("lost") river Tyburn runs approximately 10 m to the east of the proposed development. The closest open watercourse is the Grand Union Canal which lies approximately 0.9 km southeast of the Site. This watercourse is down gradient from the Site. There are no wells or potential spring lines within100 m of the Site.	British Geological Survey, 2014. Ordnance Survey Mapping. 2014. Barton, 1992.
3) Is the site within the catchment of the pond chains on Hampstead Heath?	**No**	The site is not within the catchment of the ponds on Hampstead Heath.	Arup, 2010
4) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**No**	The proposed development would cause no change in impermeable surface area; there will therefore be no change in infiltration/run-off ratios.	Site Plans.
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)?	**No**	There are no plans to incorporate infiltration-enhancing devices to the drainage network at the Site.	Site Plans.
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 or spring line.	**No**	There are no known ponds or spring lines within close proximity of the Site.	Ordnance Survey Mapping.

3 SCOPING

3.1 SURFACE WATER (Surface flow and flooding screening flowchart (Figure 3, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**Potentially**	The culverted tributary of the "lost" river Tyburn runs west of the Site from north to south at an approximately equal elevation; It is thought that this river runs beneath Lower Merton road itself (Barton, 1992; Arup, 2010) within 10 m of the Site boundary. It is most likely that some of the Site falls within the catchment of this underground watercourse; however, The site topography suggests a gradient from west to east, draining surface water away from this particular watercourse. Additionally, the size and nature of the proposed development suggests it is highly unlikely to impact on the quality of this watercourse, or the receiving waters of adjacent properties.	Arup, 2010. Ordnance Survey Mapping. Barton, 1992.

3.2 GROUND WATER (Subterranean (ground water) flow screening chart (Figure 1, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
1b) Will the proposed basement extend beneath the water table surface?	**Uncertain**	Many of the borehole logs from within a 500m radius of the Site show that no groundwater was encountered at depths comparable to that of the proposed basement during boring, this includes borehole log TQ28SE2011 located approximately 128 m northeast of the site, (provided in Appendix B). There was no water encountered during the drilling of two boreholes which were completed to depths of 5 m for the ground investigation at the site on October 2014. Water was recorded in both boreholes installed during the site investigation during subsequent monitoring between 31/10/2014 - 18/11/2014. Over this time levels rose from 2.6 mbgl to 1.8 mbgl at both boreholes. It is uncertain where the water detected in the boreholes has come from, and there are two possibilities with different implications. 1) Surface water could have infiltrated the bentonite seal, seeped past the casing and been captured in the annulus of the borehole by the clay. 2) There is a small amount of groundwater present in the London Clay and due to low permeability of the material, this was not detected during the ground investigation. Subsequently it slowly came into the borehole.	British Geological Survey, 2014. Soil Consultants, 2014

		Should the water have originated in the London Clay above the base of the proposed basement then it is very unlikely to indicate any significant groundwater flow locally. This is because the low permeability of the Clay means that the flow of water that it can transmit is very limited; this means that neighbouring properties would be very unlikely to be affected. However, the implications on the construction of the basement would need to be considered. Should the water have originated from surface water there would be no risk either to neighbouring properties or to the proposed construction. The nearest basement to the Site is at number 13 Lower Merton Rise on the opposite side of the road at a distance of approximately 46 m.	
2) Is the Site within 100m of a watercourse, well (used/disused) or potential spring line?	**Yes**	The culverted ("lost") river Tyburn runs approximately 10 m to the east of the proposed development. It is thought that this river runs beneath Lower Merton Rise itself at the front of the Site. It is quite possible that run-off from the road may enter the culverted watercourse via the drainage network. It is considered that the topography of the site drains to the east however, so it is likely that the majority of site run-off will not enter the watercourse. Furthermore, the proposed development will cause no change in impermeable surfaces so there will be no change to the surface run-off characteristics from the Site.	

4 SITE CONCEPTUAL MODEL

4.1 CONCEPTUAL UNDERSTANDING		
Geology	Superficial	There is shallow cover of 1.20 – 1.25 m of Made Ground at the Site. This is comprised of a variety of material including clay, gravel, sand, silt, flint, glass, brick and mortar.
	Bedrock	Underlying the Made Ground at the Site is the London Clay Formation; a sedimentary bedrock comprising bioturbated or poorly laminated, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. This is expected to have a local thickness of between 60 and 100 m and has been logged at a thickness of at least 24.4 m in a nearby borehole TQ28SE2011 (132 m northeast of the site) (Appendix B).
Aquifers	The London Clay is not classed as an aquifer by the Environment Agency, but as unproductive strata, which are defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow (Environment Agency, 2014).	
Groundwater levels	There is uncertainty on the existence of groundwater beneath the site based on the available data. Water was not encountered during the construction of two boreholes during the ground investigation in October 2014. However, water was recorded in both boreholes during subsequent monitoring between 31/10/2014 - 18/11/2014. Over this time levels rose from 2.6 mbgl to 1.8 mbgl at both boreholes. Soil Consultants stated that the installed bentonite takes time to properly hydrate and form a seal around the pipe, it is considered that water may have entered the pipe over this time from the surface or hear surface (email Alan Watson, 01st December 2014). Considering this and the borehole logs from the ground investigation there are two possible scenarios: 1) Surface water could have infiltrated the bentonite seal and has seeped past the casing and is captured in the annulus of the borehole by the clay. This would be a low risk scenario. 2) There is groundwater present in the London Clay and due to low permeability of the material and exceptionally low flow, this was not detected during the ground investigation. This would be a medium risk scenario for the proposed construction, though it would remain low risk for neighbouring properties. If ground water proves to be present in the London Clay at a level of 1.8 mbgl (as noted in the borehole monitoring) then the proposed basement would extend below the water table by 1.7 m at its base. The water levels would also be subject to seasonal variation.	

4.2 IMPACTS ON GROUNDWATER FLOWS

If there is groundwater present in the clay then it is unlikely to have any significant flow due to the material's low permeability. Therefore, the volume of water passing through the site would be relatively low and there would be minimal impact resulting from the proposed development.

Based upon the points above, the construction of the basement may cause a relatively minor obstruction of groundwater flow leading to slightly increased flows around the proposed basement and a negligible increase in groundwater elevation on the up gradient side of the site if groundwater is present. Based on modelling of similar sites in the London Clay, we are confident that this would not be more than a few centimetres at most.

As the development is not expected to cause a significant rise in groundwater elevation up gradient of the property (should any groundwater be present), adjacent properties are not expected to be affected. The nearest basement to the Site is at number 13 Lower Merton Rise on the opposite side of the road at a distance of approximately 46 m.

Down gradient properties are also not expected to be affected by the development.

4.3 IMPACTS ON SURFACE WATER FLOWS AND FLOODING

As the site is not expected to alter the extent of impermeable surfaces in the exterior of the site, no change is expected in the quantity, or quality, of surface water leaving the site. This also means that there will be no material change in surface flooding or flood risk in the surrounding area resulting from the development.

5 CONCLUSIONS (IMPACT ASSESSMENT)

5.1 Surface water

There is a very low risk of surface water flooding at the site as defined by the Environment Agency.

- The proposed development will not alter the area of hard standing at the site therefore there is unlikely to be any impact to surface water flows in the surrounding area.
- There is unlikely to be impact to flood risk in the local area.
- A tributary of the “lost river” Tyburn runs nearby the site at approximately 10 m to the west and is expected to be located beneath Lower Merton Rise itself. Given the nature of the proposed development, it is not considered likely that there will be any resulting impact on the quantity or quality of the surface run-off received by this watercourse.

5.2 Ground water

Potential impacts of the proposed basement development have been considered as set out in the scope of works. The following summary conclusions are made.

- The proposed basement will be constructed to a depth of 3.5 m below ground level into the underlying London Clay.
- There are insufficient data to determine the presence of groundwater.
- There are two possible scenarios to explain the presence of the water in the onsite boreholes:
    1. It is surface water that has infiltrated the borehole annulus via seepage through the bentonite seal.
    2. There is groundwater present in the clay.
- Further monitoring and testing would be required to establish the source of the water detected in the onsite boreholes (following the prior removal of any water present).
- If the water is proven to be from surface water that has infiltrated the boreholes, than the risk is considered to be negligible.
- If there is groundwater present then there is a moderate potential risk during the construction phase, as the basement would extend below the water level. Any water encountered is likely to be of low volume given that it would primarily be confined to the pockets of higher porosity material (sand and silt). In this scenario, mitigation would be required in the form of an appropriate method whilst constructing the basement, and appropriate design. Post construction the impact of the proposed basement on groundwater flood risk for the surrounding properties is considered to be low.

5.3 Recommendations

It is recommended that the source of the water detected in the onsite boreholes is established before final decisions are made on the design and construction methods for the basement. This can be done by purging the borehole using a simple bailer and then monitoring for a longer period during a dry spell of weather.

REFERENCES

Arup, 2010. Camden Geological, Hydrogeological and Hydrological Study.

Barton, N., 1992. The Lost Rivers of London, revised edition. Historical Publications Ltd. London.

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Camden Council, 2013. Camden Planning Guidance: Basements and lightwells. London Borough of Camden, CPG4.

Environment Agency, 2014. What's in your backyard website. Received from http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e, November/December 2014.

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Soil Consultants Ltd, 2014. Ground Investigation Report. 9551/AW/SCW.

APPENDICES

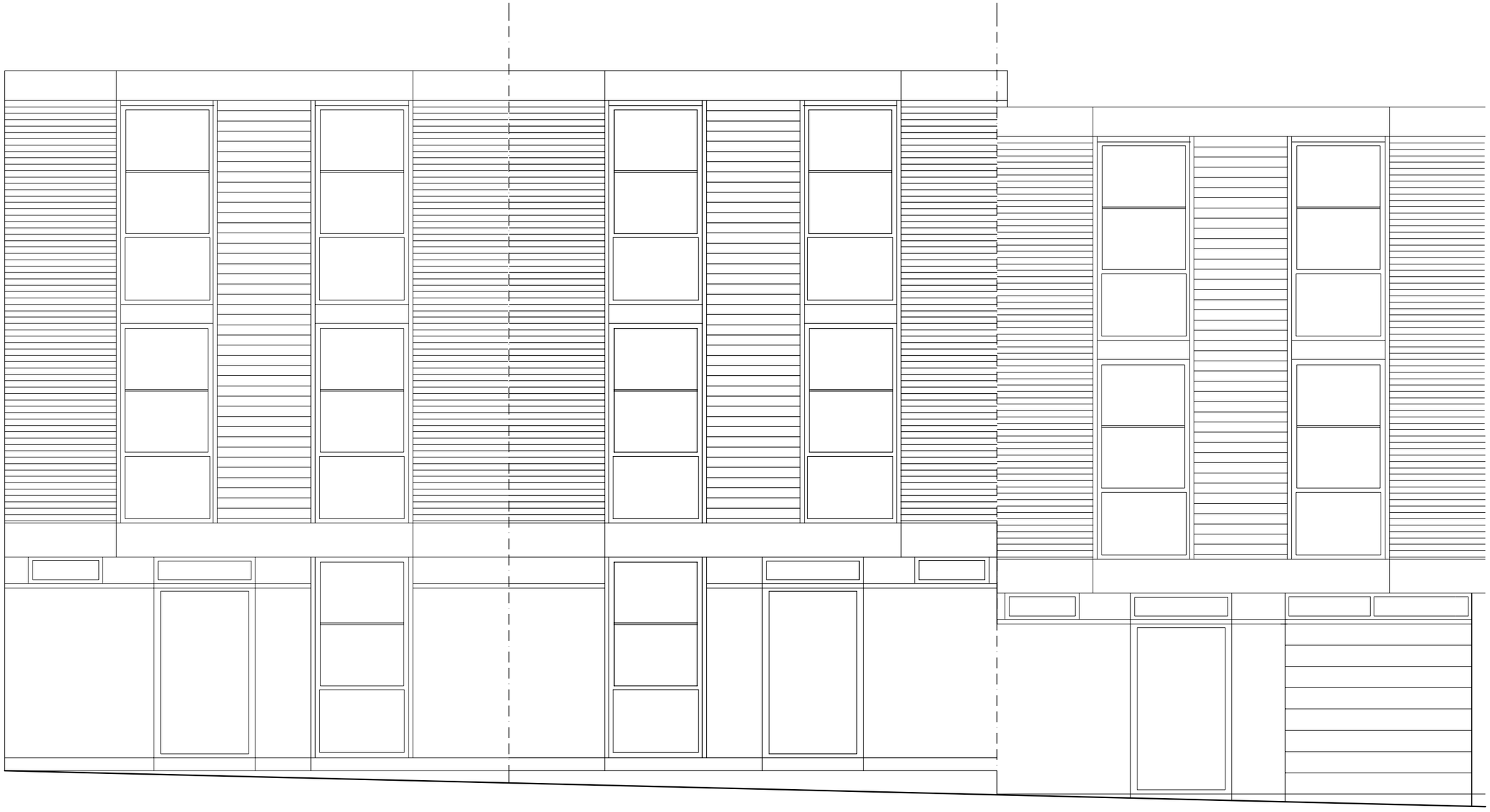
APPENDIX A

Proposed Development Plans

HOUSE No.28

HOUSE No.26

HOUSE No.24



NEW WINDOW AT
GROUND LEVEL

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NOTES:

REVISIONS:

PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

Scale:
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Date:
14.10.13

DRAWING TITLE:
FRONT ELEVATION
as Proposed

Dwg No:
LMR26/2-PP1

Rev:

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HOUSE No.24

HOUSE No.26

HOUSE No.28

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LONDON NW3 3SP

Scale:
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Date:
14.10.13

DRAWING TITLE:
REAR ELEVATION
as Proposed

Dwg No:
LMR26/2-PP2

Rev:

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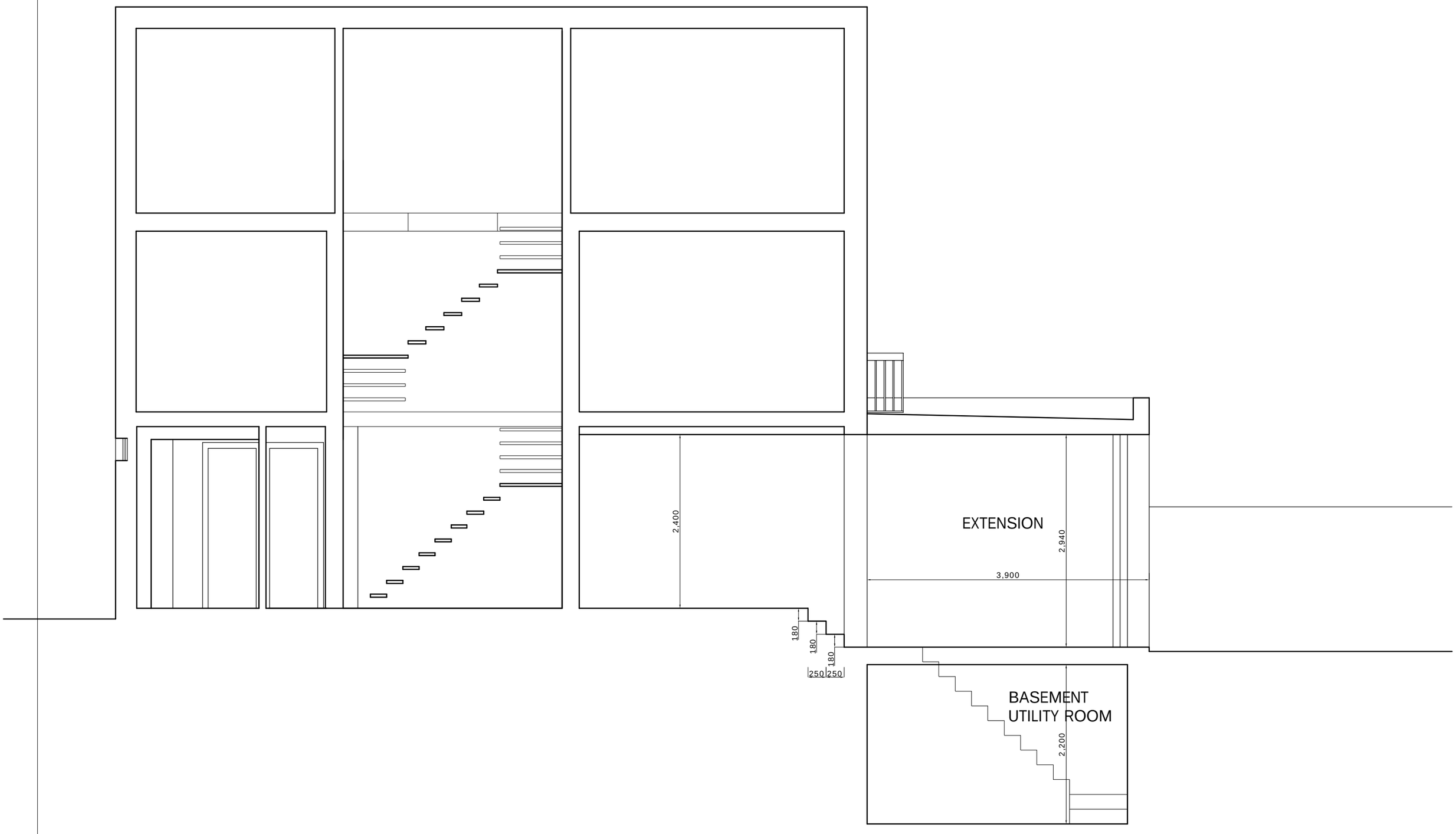

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LONDON NW3 3SP

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Date:
14.10.13

DRAWING TITLE:
LONG SECTION A-A
as Proposed

Dwg No:
LMR26/2-PP3

Rev:

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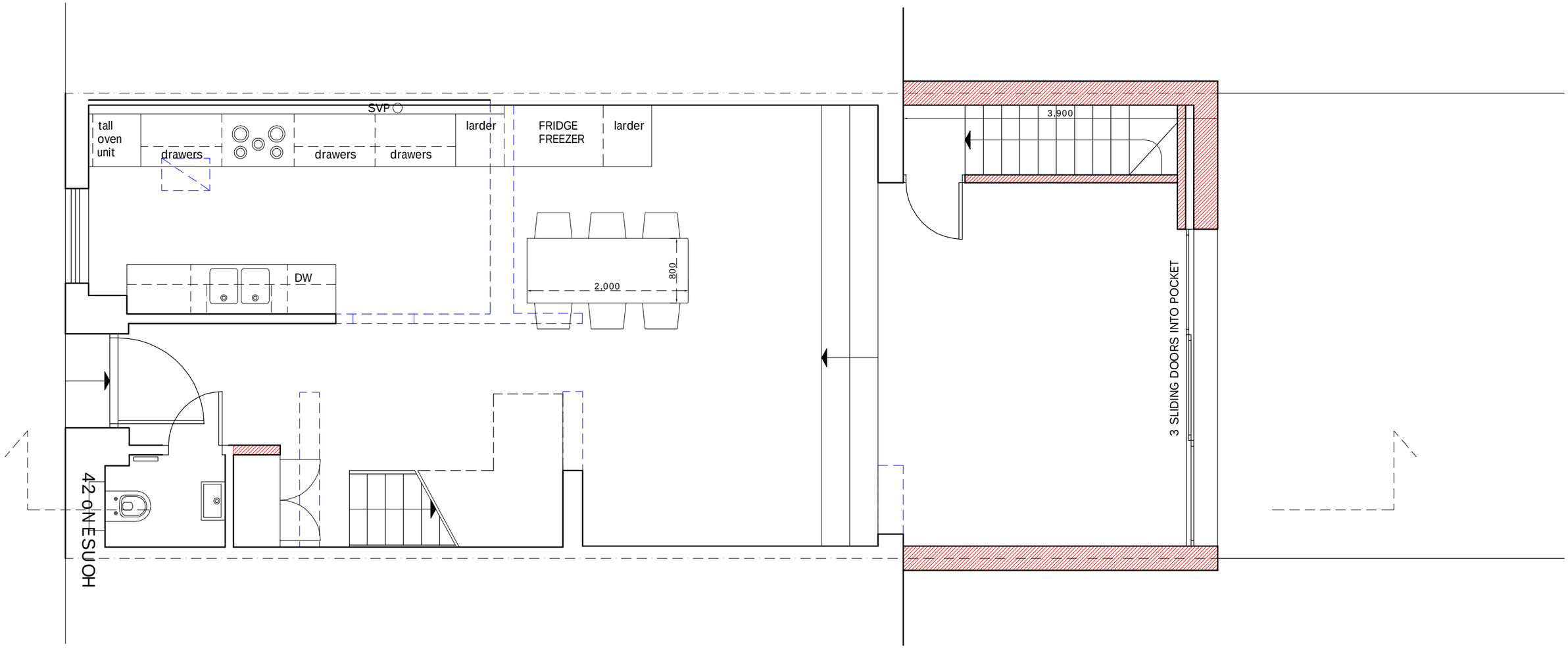

WALLS TO BE REMOVED

NEW WALLS

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PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

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Date:
14.10.13

DRAWING TITLE:
GROUND FLOOR PLAN
as Proposed

Dwg No:
LMR26/2-PP4

Rev:

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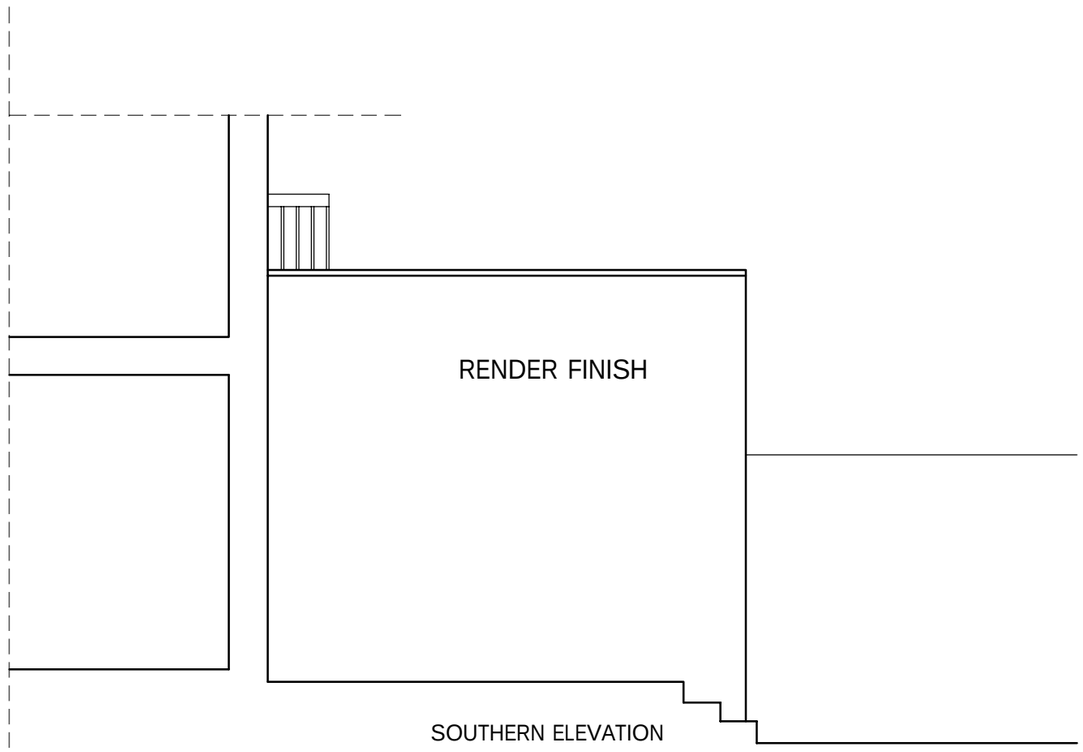
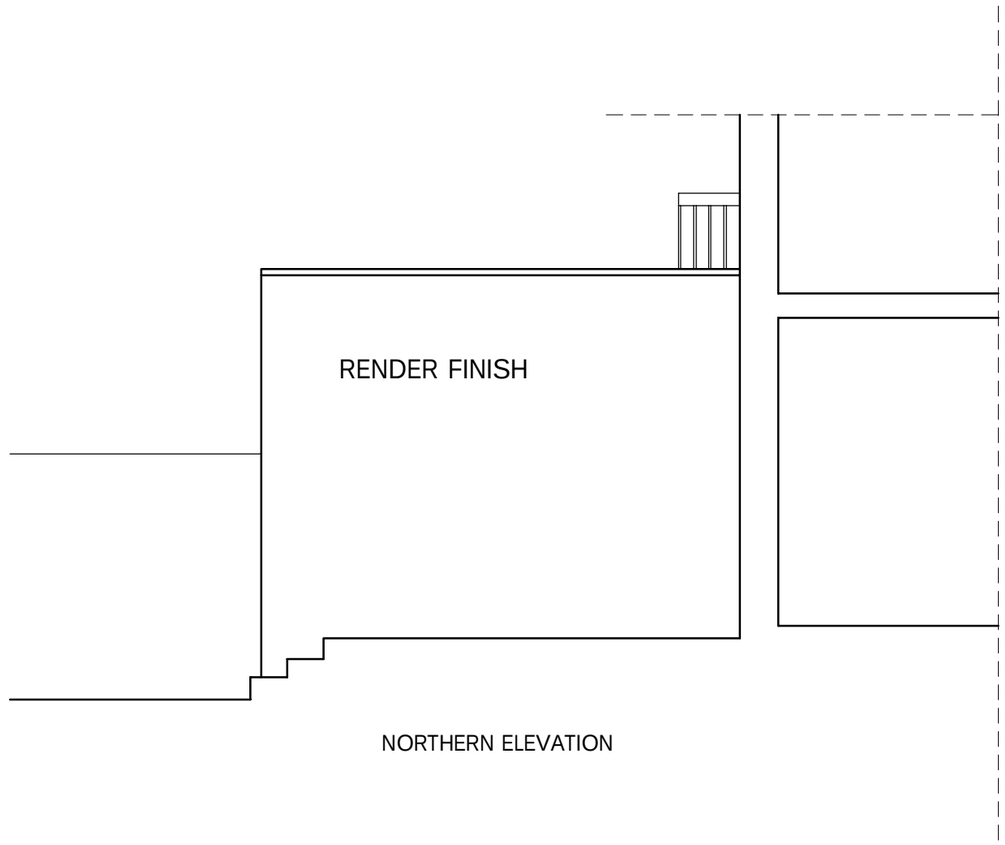


SOUTHERN ELEVATION



NORTHERN ELEVATION

ROOF PLAN

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LONDON NW3 3SP

Scale:
1:50 @ A3
1:100 @ A3

Date:
14.10.13

DRAWING TITLE:
SIDE ELEVATIONS, ROOF PLAN
as Proposed

Dwg No:
LMR26/2-PP5

Rev:

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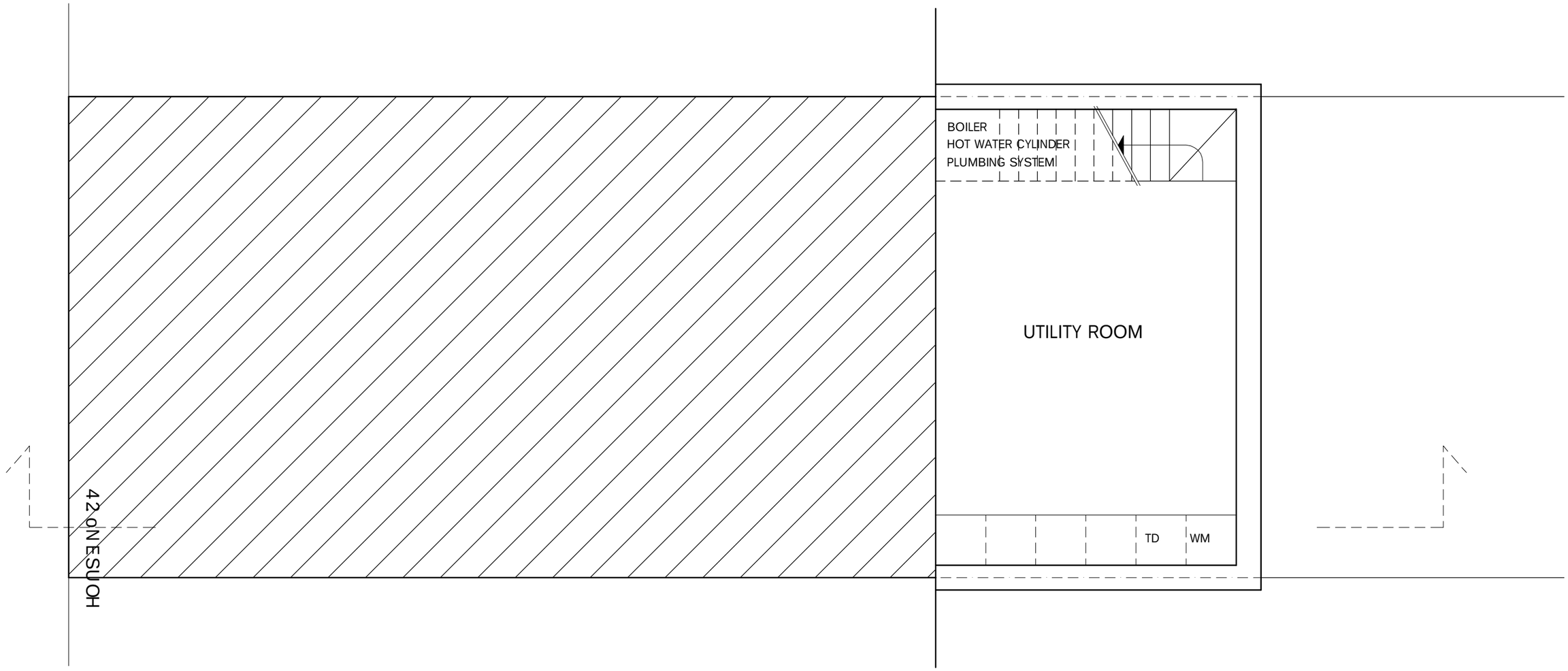

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NOTES:

REVISIONS:

PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

Scale:
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Date:
14.10.13

DRAWING TITLE:
BASEMENT FLOOR PLAN
as Proposed

Dwg No:
LMR26/2-PP6

Rev:

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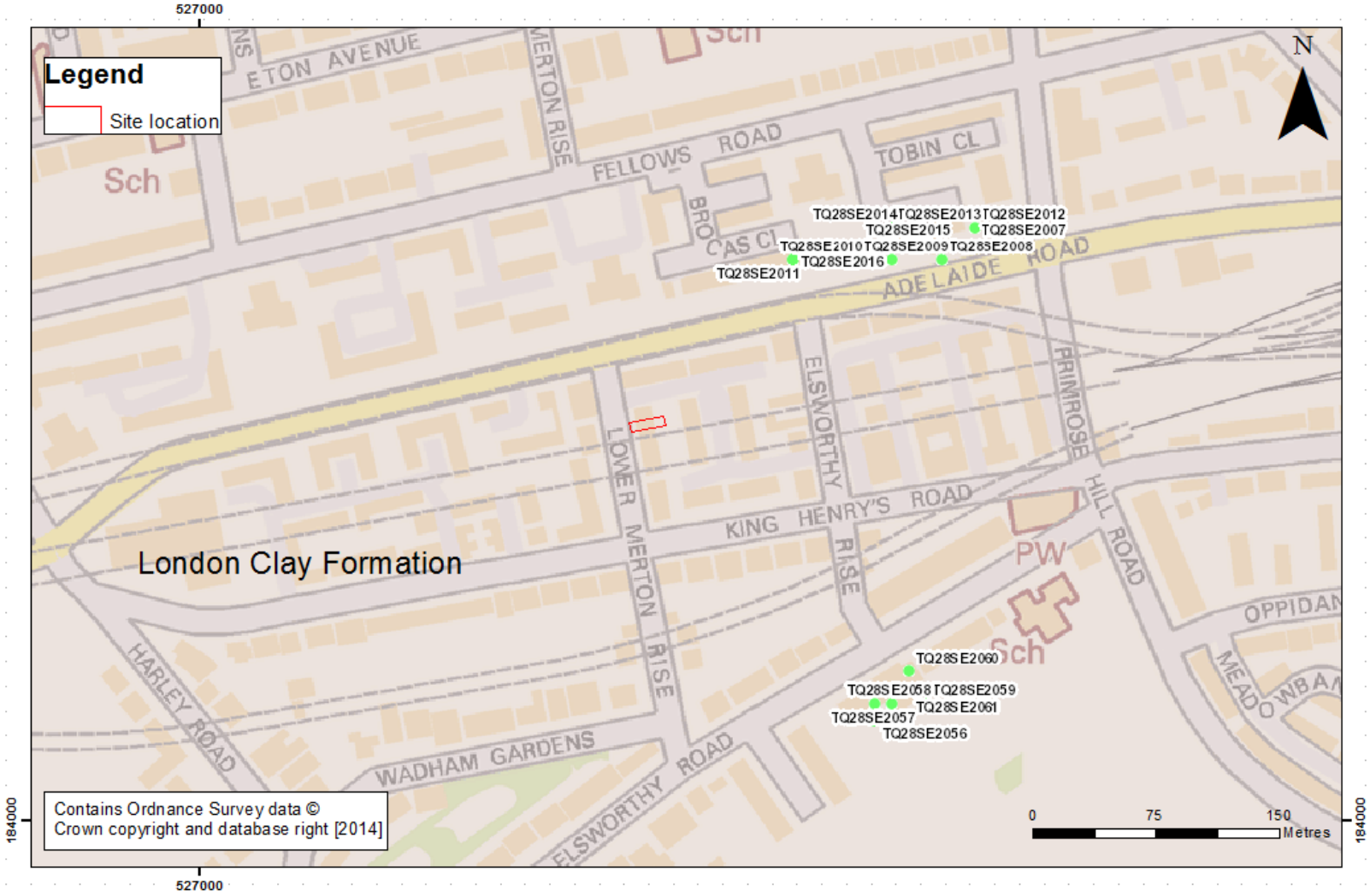
APPENDIX B

Geological Data



Site geology

TERRESEARCH LIMITED

BOREHOLE NO. 5

2736
8434

Contract Name Adelaide Road
Report No. S. 476/12
Client W. E. J. Budgen & Partners
Site Address Adelaide Road, London N.W. 3.
Address 54, Queen Anne Street, London, W.1.

Standing Water Level
Diameter 8"
Water Struck None
Method of Boring Shell/Auger
Ground Level
Start 27.10.62 Finish 29.10.62
Remarks:

Description of Strata	Thickness	Depth	Disturbed Samples	'U' Cores and 'N' P. Test
Made Ground	0'6"	0'6"	J3001 0'6"	
Brown clay	5'6"	6'0"	J3002 3'0" J3003 6'0"	
Brown mottled clay	14'0"	20'0"	J3004 8'0" J3006 13'0" J3007 17'0"	U3005 10'0"
Brown clay	16'0"	36'0"	J3009 23'0" J3010 27'0" J3012 33'0" J3013 37'0"	U3008 20'0" U3011 30'0"
Blue clay	44'0"	80'0"	J3015 43'0" J3016 47'0" J3018 53'0" J3019 57'0" J3021 63'0" J3022 67'0" J3024 73'0" J3025 77'0"	U3014 40'0" U3017 50'0" U3020 60'0" U3023 70'0" U3026 78'6"
TOTALS	80'0"	80'0"		

NOTES: 1. Descriptions are given in accordance with the B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Samples.
B ,, Bulk Samples.
W ,, Water Samples.
U ,, Undisturbed Core Samples. These are nominal 4 in. diam. and 18 in. long. Depths shown are top of sample.
N ,, Number of blows per ft. penetration with Standard Penetration Tests.

Borehole log for TQ28SE2011

APPENDIX C

Site Ground Investigation Report

GROUND INVESTIGATION REPORT

PROPOSED DEVELOPMENT:

26, LOWER MERTON RISE, CAMDEN, LONDON, NW3 3SP

Client:	**RICHARD MAX** **26, Lower Merton Rise** **Camden** **London NW3 3SP**
Consulting Engineers:	**ESI LTD** **New Zealand House** **160, Abbey Foregate** **Shrewsbury** **SY2 6FD**
Report ref:	**9551/AW/SCW**
Date:	**27th November 2014 [Rev 0]**

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GROUND INVESTIGATION REPORT

PROPOSED DEVELOPMENT:

26, LOWER MERTON RISE, CAMDEN, LONDON, NW3 3SP

DOCUMENT ISSUE STATUS:

Issue	Date	Description	Author	Checked / approved
Rev 0	**27 Nov 2014**	**First issue**	**Alan Watson** BSc [Eng] CEnv CEng MICE	**Stuart Wagstaff** BSc(Hons), MSc, CGeol, FGS

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APPENDIX

1.0 INTRODUCTION

Consideration is being given to the construction of a single levels basement below 26, Lower Merton Rise. In connection with the proposed works, Soil Consultants Ltd [SCL] were commissioned to carry out a ground investigation to include the following elements:

- Identification of ground sequence
- Factual report on findings

This factual report describes the investigation undertaken, gives a summary of the ground conditions encountered and then presents the factual records.

2.0 SITE DESCRIPTION

The site is located on Lower Merton Rise in the London Borough of Camden, with its centre at approximate NGR 527270E 184240N and with overall dimensions of approximately 25m x 5m. No 26 is a 3-storey residential house of traditional brick construction with a flat roof. The existing house occupies approximately 70% of the site area and there is a block paved parking area at the frontage and an open garden patio area in the rear [eastern] area. The site is sensibly level and lies at approximately +51mOD [inferred from the site survey drawing [No 4638 by Aworth Survey Consultants].

The site is surrounded by residential properties of similar construction. The property is joined to No.28 Lower Merton Rise to the north and No.24 to the immediate south.

A Network Rail Tunnel runs in an E-W direction about 14m south of the site. Information on the depth and alignment of the tunnel is presented on the appended plan and section.

The current site features are shown on the Site Plan which is included in the Appendix.

3.0 EXPLORATORY WORK

The ground investigation was carried out in October 2014 and comprised the following elements.

Window sample boreholes

Two window sample boreholes [WS1 & WS2] were completed using hand held/operated equipment under the supervision of an experienced geotechnical engineer. This method provides a near-continuous profile of the soil and allows for pocket penetrometer and hand vane tests to provide an assessment of the soil strength/consistency. Representative samples were taken for geotechnical and environmental testing. Monitoring pipes were installed in WS1 & WS2.

Ground-water monitoring

Ground-water monitoring was undertaken by the Client's Agent on 31st October and 7th November 2014.

Geotechnical laboratory testing

Geotechnical laboratory testing comprised natural moisture content and index properties tests [Atterberg Limits].

Contamination testing

Selected soil samples were delivered to a specialist laboratory [QTS Environmental Ltd] and the following testing was carried out:

- general soil suite - 2no samples
- soluble sulphate/pH analyses - 8no samples

The engineering logs of the exploratory holes and the laboratory testing results are included in the Appendix.

4.0 GROUND CONDITIONS

The geological survey map of the area indicates that the site is underlain by the London Clay Formation, which has been confirmed by our ground investigation together with a thin layer of overlying made ground.

4.1 Made ground

The made ground at the site extended to depths of 1.25m [WS1] and 1.20m [WS2]. WS1 was positioned within the rear patio area where a tiled surface and underlying granular sub-base had been removed prior to our drilling. A block paved surface over granular sub-base was encountered in WS2 at the Lower Merton Rise frontage. Beneath this, stiff dark grey, silty gravelly clay was encountered in WS1 and dark grey clayey ashy gravelly sand / sandy ashy gravelly clay was encountered in WS2. The gravel constituents comprise brick, flint, occasional mudstone, mortar, charcoal, wire and glass. Live rootlets were evident throughout this made ground. A lower layer of brown gravelly clay including brick, flint and charcoal was encountered between 0.95m and 1.20m depth in WS2.

4.2 London Clay

The London Clay initially comprised an upper layer of firm orangish brown and blue grey / grey fissured clay with occasional flint gravel [WS2] and calcareous concretions to depths of 3.00m [WS1] and 2.40m [WS2]. This upper layer may be partially re-worked and became stiff below depths of 2.50m [WS1] and 2.00m [WS2].

Stiff brown and blue grey fissured clay was encountered below depths of 3.00m [WS1] and 2.40m [WS2]. In WS2 selenite crystals were seen below 2.40m depth and orangish brown silt was evident on the fissure surfaces below depths of 4.00m [WS1] and 3.90m [WS2].

Live rootlets were evident to depths of 2.10m in WS1 and 2.30m in WS2. Laboratory index testing has indicated the London Clay to be of a high to very high plasticity and **High** volume change potential [with reference to NHBC Chapter 4.2 'Building near trees']. Our laboratory index testing did not indicate any significant desiccation within the samples tested as the moisture contents were generally higher than the corresponding plastic limits.

This formation extended to at least 5m depth in the boreholes and on the basis of published records is likely to extend to a significant depth well below the influence of the development.

4.3 Ground-water

Ground-water was not encountered during the drilling of WS1 or WS2. Ground-water levels have been checked by the Client's Agent who monitored the standpipes on 31st October and 7th November 2014, when ground-water levels of 2.6m BGL and 2.1m BGL were recorded in WS1 and 2.6m BGL and 1.8m BGL were recorded in WS2. Ground-water levels can vary due to seasonal and other effects.

4.4 Environmental observations

No obvious olfactory or visual signs of soil contamination were encountered in the boreholes. Laboratory analysis found elevated values of Lead in the 2No soil samples tested. Low to moderate levels of soluble sulphates were measured in selected soil samples with near neutral pH values.

GENERAL INFORMATION, LIMITATIONS AND EXCEPTIONS

Unless otherwise stated, our Report should be construed as being a Ground Investigation Report [GIR] as defined in BS EN1997-2. Our Report is not intended to be and should not be viewed or treated as a Geotechnical Design Report [GDR] as defined in EN1997-2. Any 'design' recommendations which are provided are for guidance only and are intended to allow the designer to assess the results and implications of our investigation/testing and to permit preliminary design of relevant elements of the proposed scheme.

The methods of investigation used have been chosen taking into account the constraints of the site including but not limited to access and space limitations. Where it has not been possible to reasonably use an EC7 compliant investigation technique we have adopted a practical technique to obtain indicative soil parameters and any interpretation is based upon our engineering experience and relevant published information.

The Report is issued on the condition that Soil Consultants Ltd will under no circumstances be liable for any loss arising directly or indirectly from ground conditions between the exploratory points which differ from those identified during our investigation. In addition Soil Consultants Ltd will not be liable for any loss arising directly or indirectly from any opinion given on the possible configuration of strata both between the exploratory points and/or below the maximum depth of the investigation; such opinions, where given, are for guidance only and no liability can be accepted as to their accuracy. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in using this Report.

Comments made relating to ground-water or ground-gas are based upon observations made during our investigation unless otherwise stated. Ground-water and ground-gas conditions may vary with time from those reported due to factors such as seasonal effects, atmospheric effects and and/or tidal conditions. We recommend that if monitoring installations have been included as part of our investigation, continued monitoring should be carried out to maximise the information gained.

Specific geotechnical features/hazards such as [but not limited to] areas of root-related desiccation and dissolution features in chalk/soluble rock can exist in discrete localised areas - there can be no certainty that any or all of such features/hazards have been located, sampled or identified. Where a risk is identified the designer should provide appropriate contingencies to mitigate the risk through additional exploratory work and/or an engineered solution.

Where a specific risk of ground dissolution features has been identified in our Report [anything above a 'low' risk rating], reference should be made to the local building control to establish whether there are any specific local requirements for foundation design and appropriate allowances should be incorporated into the design. If such a risk assessment was not within the scope of our investigation and where it is deemed that the ground sequence may give rise to such a risk [for example near-surface chalk strata] it is recommended that an appropriate assessment should be undertaken prior to design of foundations.

Where spread foundations are used, we recommend that all excavations are inspected and approved by suitably experienced personnel; appropriate inspection records should be kept. This should also apply to any structures which are in direct contact with the soil where the soil could have a detrimental effect on performance or integrity of the structure.

Ground contamination often exists in small discrete areas - there can be no certainty that any or all such areas have been located, sampled or identified.

The findings and opinions conveyed in this Report may be based on information from a variety of sources such as previous desk studies, investigations or chemical analyses. Soil Consultants Limited cannot and does not provide any guarantee as to the authenticity, accuracy or reliability of such information from third parties; such information has not been independently verified unless stated in our Report.

Our Report is written in the context of an agreed scope of work between Soil Consultants Ltd and the Client and should not be used in any different context. In light of additional information becoming available, improved practices and changes in legislation, amendment or re-interpretation of the assessment or the Report in part or in whole may be necessary after its original publication.

Unless otherwise stated our investigation does not include an arboricultural survey, asbestos survey, ecological survey or flood risk assessment and these should be deemed to be outside the scope of our investigation.

[Rev_1_08_03_2013]

APPENDIX

Fieldwork, in-situ testing and monitoring

- Window sample borehole records

Laboratory testing

- Index property testing
- Plasticity chart

Contamination testing [QTS Environmental]

- General soil suite
- Soluble sulphate/pH results

Plans, drawings & photographs

- Proposed development plans and section
- Site plan
- Location plan

Foreword to: Window Sampler Boreholes

Window Sample Boreholes are constructed by driving in steel sample tubes in which long slots have been cut to enable the soil to be examined, tested or sampled. The tubes are either 1m or 2m in length. The borehole commences using a large diameter tube, 70mm or 80mm, with each succeeding tube reducing usually by 10mm in diameter to assist the extraction of the tube from the ground. Thus, it is theoretically possible to obtain a total continuous sample of the soil for examination or testing.

Window Sample boreholes are a means of rapid and economic sampling where access is not necessarily good or where impact of the investigation must be kept to a minimum.

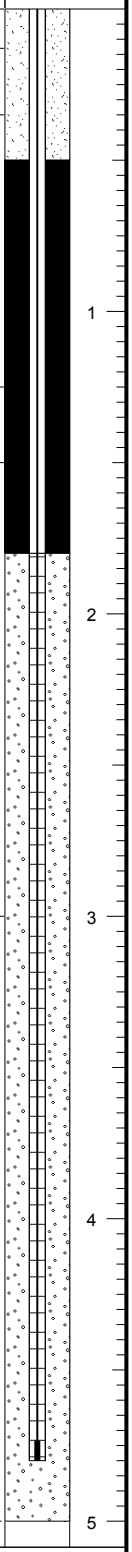
The method is primarily suited to clay soils and can also achieve reasonable penetration into many granular soils. Soil recovery beneath the water table in granular soils can however be reduced.

The open slot in the sample tube allows hand shear vane and pocket penetrometer tests to be carried out. Samples can also be taken where necessary for laboratory testing, including moisture content, index property tests and contamination analyses.

Hand Shear Vane	:	The shear strength of cohesive soils are reported in kPa.
Pocket Penetrometer	:	The unconfined compression strengths values are reported in kg/cm^2.
SPT	:	The SPT tests results are reported as field test. Corrected SPT results are presented as an addendum sheet and soil descriptions incorporate the corrected values in accordance with BS EN ISO 22476-3, 2005, National Annex A

Site & Location:	**26, Lower Merton Rise** **Camden, London NW3 3SP**	Borehole No:	**WS1**
Client:	**Richard Max**	Coords (E/N):	527280.00 - 184245.00
Engineer:	**ESI Ltd**	Ground Level (m):	51.62
		Sheet 1 of 1	
		Report No:	9551/AW

Progress & Observations	Samples & Tests Type	Samples & Tests Depth (m)	Field Test Results	Strata Depth (m)	Strata Level (m)	Legend	Strata Description	Backfill / Installation
BH commenced: 23/10/14				0.13	51.49		MADE GROUND : Tile over concrete basecourse.	
							MADE GROUND : Orangish brown clayey sand and flint gravel.	
BH dia: 85mm reducing to 60mm				0.35	51.27		MADE GROUND : Stiff dark grey silty gravelly clay with rootlets. Gravel comprises flint, brick, charcoal, mortar, glass and wire. Pockets of reddish brown clayey sand.	
	PP	0.50	2.1					
	ES	0.50						
	D	0.80						
				1.25	50.37		Firm grey and orangish brown fissured CLAY with live rootlets.	
	D	1.40						
	PP	1.40	1.9	1.50	50.12		Firm orangish brown, grey and blue grey fissured CLAY with occasional calcareous concretions and with rootlets.	
	PP	1.60	1.9					
	HV	1.70	52					
	D	1.70						
	PP	1.80	1.7					
	PP	2.00	1.5					
							...live rootlets not seen below 2.10m depth	
	PP	2.20	1.8					
	HV	2.30	56					
	D	2.30						
	PP	2.40	2.4					
							...becoming stiff below 2.50m depth	
	PP	2.60	2.6					
	D	2.70						
	HV	2.70	68					
	PP	2.80	2.7				*...occasional sandy pocket at 2.80m depth*	
	PP	3.00	3.5	3.00	48.62		Stiff brown and blue grey fissured CLAY.	
	PP	3.20	3.3					
	D	3.30						
	HV	3.30	82					
	PP	3.40	3.2					
	PP	3.60	3.0					
	PP	3.80	3.6					
	D	4.00					*...with occasional orangish brown silt on fissure surfaces below 4.00m depth*	
	PP	4.00	3.6					
	HV	4.00	87					
	PP	4.20	3.2					
	PP	4.40	3.5				*...ancient decaying rootlets at 4.40m depth*	
	D	4.40						
	PP	4.60	3.4					
Groundwater not encountered	HV	4.80	110					
	PP	4.80	3.3					
	D	4.80						
	PP	4.90	3.4	5.00	46.62		End of borehole at 5.00 m	



Key: U = Undisturbed B = Bulk D = Small disturbed W = Water E = glass jar & plastic tub SPT/S = split spoon SPT/C = solid cone HV = Hand Vane [kPa]

PP = Pocket Penetrometer [kg/cm2] PID = Photo Ionisation Detector [ppmv]

Borehole type: Window Sampler

Remarks :- Hand excavation to 0.35m completed by others prior to drilling. Standpipe 35mm dia installed to 4.80m on completion, slotted with gravel filter 1.80m to 4.80m, bentonite seal 0.35m to 1.80m, original trial pit to be backfilled by others.

Borehole No: **WS1**

[* = full SPT penetration not achieved - see summary sheet]

Soil Consultants

Site & Location:	**26, Lower Merton Rise** **Camden, London NW3 3SP**	Borehole No:	**WS2**
Client:	**Richard Max**	Coords (E/N):	527260.00 - 184240.00
Engineer:	**ESI Ltd**	Ground Level (m):	51.85
		Sheet 1 of 1	
		Report No:	9551/AW

Progress & Observations	Samples & Tests Type	Samples & Tests Depth (m)	Field Test Results	Strata Depth (m)	Strata Level (m)	Legend	Strata Description	Backfill / Installation
BH commenced: 23/10/14				0.07	51.78		MADE GROUND : Block paving.	
							MADE GROUND : Orangish brown clayey sand and flint gravel.	
				0.24	51.61		MADE GROUND : Grey sand and flint gravel.	
BH dia: 85mm reducing to 60mm				0.45	51.40			
	ES	0.50					MADE GROUND : Dark grey clayey ashy gravelly sand / sandy ashy gravelly clay with rootlets. Gravel comprises brick, flint, occasional mudstone, mortar and glass.	
	D	0.80						
				0.95	50.90		MADE GROUND : Brown gravelly clay. Gravel comprises brick, flint and charcoal.	
				1.20	50.65			
	PP	1.25	1.9				Firm oranghish brown and blue grey fissured CLAY with occasional flint gravel and calcareous concretions and with rootlets.	
	D	1.25						
	PP	1.50	2.0					
	PP	1.70	1.5					
	D	1.80						
	HV	1.80	51				*…infested with live rootlets at 1.80m depth*	
	PP	1.90	2.2					
							…becoming stiff below 2.00m depth	
	PP	2.10	2.9					
	D	2.30					*…live rootlets not seen below 2.30m depth*	
	PP	2.30	2.4	2.40	49.45		*…becoming light orange brown and very silty below 2.30m depth*	
	PP	2.50	2.6				Stiff brown and blue grey fissured CLAY with fine selenite crystals.	
	HV	2.50	76					
	PP	2.70	2.9					
	HV	2.90	72					
	D	2.90						
	PP	2.90	3.0					
	PP	3.10	2.9					
	PP	3.30	2.6					
	PP	3.50	3.9					
	D	3.50						
	HV	3.50	73					
	PP	3.70	3.5					
	PP	3.90	3.1				*…ancient decaying rootlet at 3.90m depth*	
							…with occasional orangish brown silt on fissure surfaces below 3.90m depth	
	PP	4.10	4.0					
	D	4.10						
	PP	4.30	3.7					
	D	4.50						
	PP	4.50	4.2					
	HV	4.50	92					
	PP	4.70	4.0					
Groundwater not encountered								
	PP	4.90	4.9					
				5.00	46.85		End of borehole at 5.00 m	

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water E = glass jar & plastic tub SPT/S = split spoon SPT/C = solid cone HV = Hand Vane [kPa]

PP = Pocket Penetrometer [kg/cm2] PID = Photo Ionisation Detector [ppmv]

Borehole type: Window Sampler

Remarks :- Hand excavation to 0.24m completed by others prior to drilling. Standpipe 35mm dia installed to 4.94m on completion, slotted with gravel filter 1.94m to 4.94m, bentonite seal 0.35m to 1.94m, block paving replaced loose at surface.

Borehole No: **WS2**

[* = full SPT penetration not achieved - see summary sheet]

Site & Location: **26, Lower Merton Rise, Camden, London NW3 3SP**

Report No: **9551/AW**

SUMMARY OF CLASSIFICATION TEST RESULTS

BH ID	Depth (m)	Type	w (%)	wL (%)	wP (%)	Pass 425 (%)	IP (%)	Mod IP (%)	IL (%)	LOI (%)	Description
WS1	0.80	D	20								MADE GROUND : Stiff dark grey silty gravelly clay with rootlets. Gravel comprises flint, brick, charcoal, mortar, glass and wire. Pockets of reddish brown clayey sand.
WS1	1.40	D	28								Grey and orangish brown fissured CLAY with live rootlets.
WS1	1.70	D	33	73	23	95	50		0.20		Orangish brown, grey and blue grey fissured CLAY with occasional calcareous concretions.
WS1	2.30	D	29								Orangish brown, grey and blue grey fissured CLAY with occasional calcareous concretions.
WS1	2.70	D	30								Orangish brown, grey and blue grey fissured CLAY with occasional calcareous concretions.
WS1	3.30	D	32								Brown and blue grey fissured CLAY.
WS1	4.00	D	31	73	27	46	46		0.09		Brown and blue grey fissured CLAY.
WS1	4.40	D	30								Brown and blue grey fissured CLAY.
WS1	4.80	D	29								Brown and blue grey fissured CLAY.
WS2	0.80	D	25								MADE GROUND : Dark grey clayey ashy gravelly sand / sandy ashy gravelly clay with rootlets. Gravel comprises brick, flint, occasional mudstone, mortar and glass.
WS2	1.25	D	34	75	23	52	52		0.22		Oranghish brown and blue grey fissured CLAY with occasional flint gravel and calcareous concretions and with rootlets.
WS2	1.80	D	29								Oranghish brown and blue grey fissured CLAY with occasional flint gravel and calcareous concretions and with rootlets.
WS2	2.30	D	26								Oranghish brown and blue grey fissured CLAY with occasional flint gravel and calcareous concretions and with rootlets.
WS2	2.90	D	28								Brown and blue grey fissured CLAY with fine selenite crystals.
WS2	3.50	D	30	70	26	44	44		0.10		Brown and blue grey fissured CLAY with fine selenite crystals.
WS2	4.10	D	32								Brown and blue grey fissured CLAY with fine selenite crystals.
WS2	4.50	D	31	76	26	50	50		0.10		Brown and blue grey fissured CLAY with fine selenite crystals.

Testing in accordance with BS EN ISO 17892 unless specified otherwise

Date: 14 Nov 14

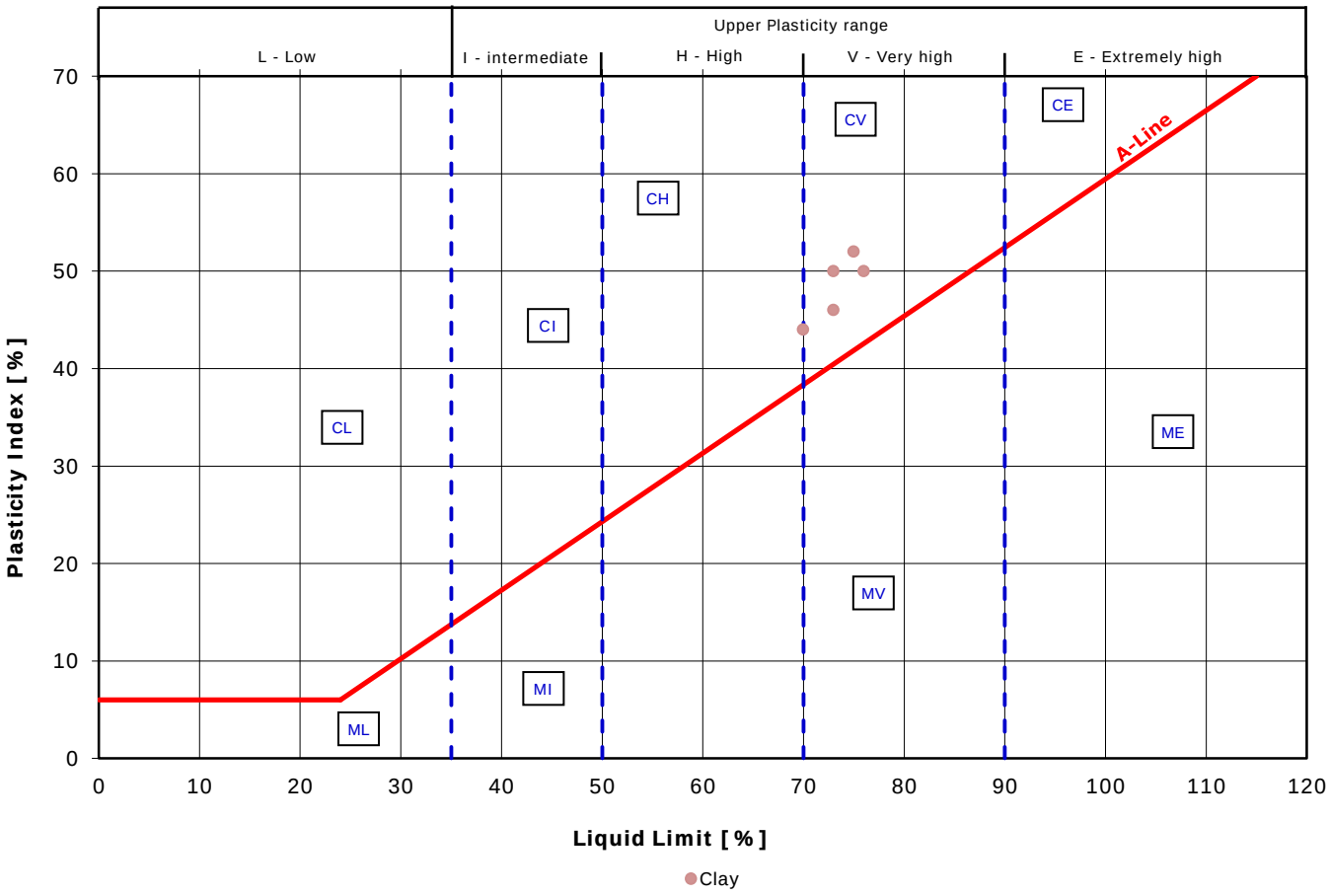
Modified Plasticity Index calculated in accordance with NHBC Standards Chapter 4.2 (reported if %passing 425mm <95%)

Percent passing 425μm: by estimation, by hand* or by sieving**

Soil Consultants

Site & Location	26, Lower Merton Rise Camden, London NW3 3SP	Report No:	9551/AW

Plasticity Chart



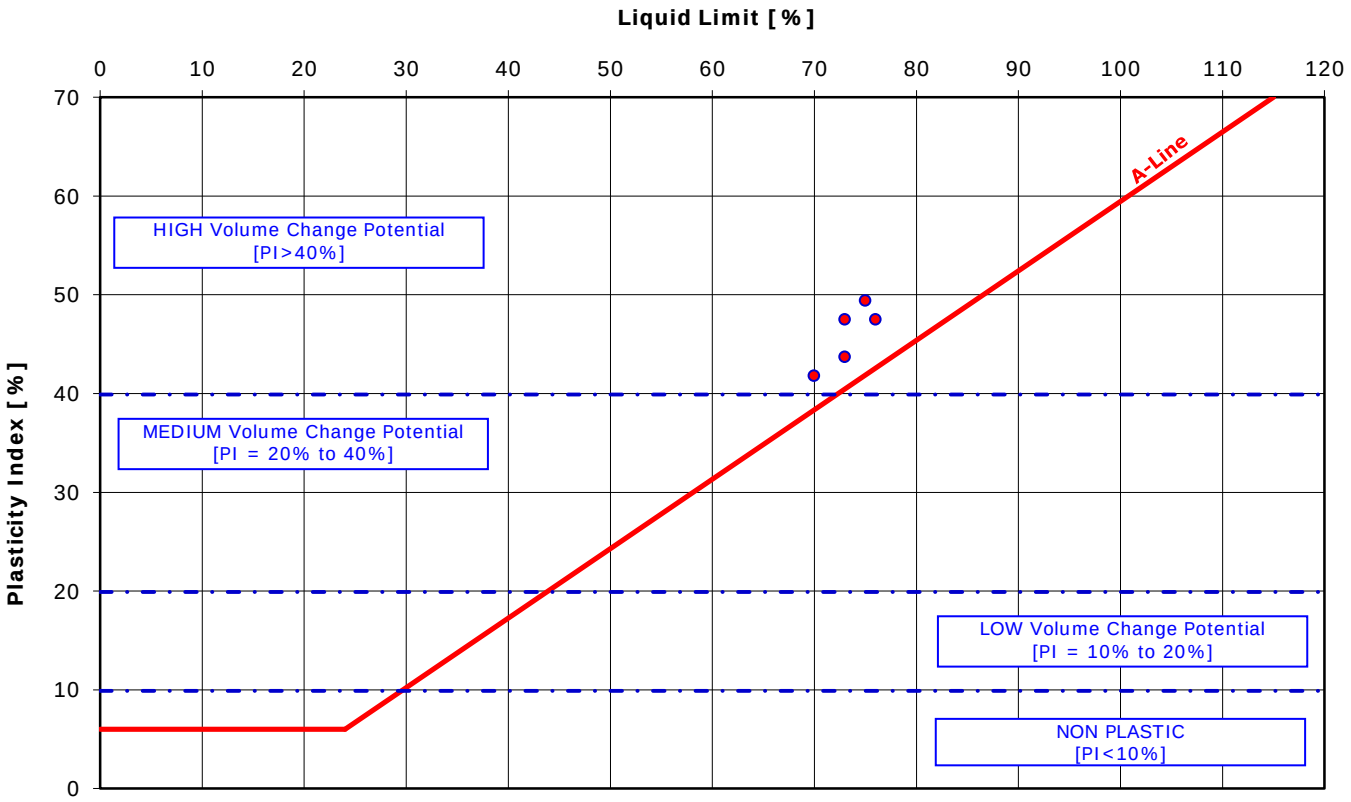
M - SILT [plots below the A-Line}

C - CLAY [plots above the A-Line]

Classification in accordance with BS5930:1999+A2:2010 "Code of practice for site investigations"

Site & Location	26, Lower Merton Rise Camden, London NW3 3SP	Report No:	9551/AW

Plasticity Chart



Modified Plasticity Index, I'p:

$$I'p = \frac{Ip \times (\%\ \text{passing 425mm})}{100\%}$$

[where Ip = Plasticity Index]

Classification in accordance with NHBC Standards, Part 4 'Foundations', Chapter 4.2 'Building near trees'

Soil Consultants

Foreword to: CONTAMINATION TESTING AND ASSESSMENT

The following statements are designed to inform and guide the Client and other potential parties intending to rely upon this report, with the express intent of protecting them from misunderstanding as to the extent and thus the potential associated risks that may result from proceeding without further evaluations or guidance.

1) Unless otherwise stated in this report, the testing of soils and waters is based on a range of commonly occurring potential contaminants for the specific purpose of providing a general guidance evaluation for the proposed form of development. Thus, the range of potential contaminants is neither exhaustive nor specifically targeted to any previous known uses or influences upon the site.

2) The amount and scope of the testing should not be assumed to be exhaustive but has been selected, at this stage, to provide a reasonable, general view of the site ground conditions. In many cases this situation is quite sufficient for the site to be characterised for the purposes of development and related Health and Safety matters for persons involved in or directly affected by the site development works. It must be understood, however, that in certain circumstances aspects or areas of the site may require further investigation and testing in order to fully clarify and characterise contamination issues, both for regulatory compliance and for commercial reasons.

3) The scope of the contamination testing must not automatically be regarded as being sufficient to fully formulate a remediation scheme. For such a scheme it may be necessary to consider further testing to verify the effectiveness of the remedial work after the site has been treated. It must be understood that a remediation scheme which brings a site into a sufficient state for the proposed development ("fit for purpose") under current legislation and published guidance, may result in some contamination being left in-situ. It is possible that forthcoming legislation may result in a site being classified by the Local Authority and assigned a "Degree of Risk" related to previous use or known contamination.

4) The scope of the environmental investigation and contamination testing must not be automatically regarded as sufficient to satisfy the requirements in the wider environmental setting. The risks to adjacent properties and to the water environment are assessed by the regulatory authorities and there may be a requirement to carry out further exploration, testing and, possibly monitoring in the short or long term. It is not possible to sensibly predict the nature and extent of such additional requirements as these are the direct result of submissions to and liaison with the regulatory authorities. It is imperative, therefore, that such submissions and contacts are made as soon as possible, especially if there are perceived to be critical features of the site and proposed scheme, in this context.

5) New testing criteria have been implemented by the Environment Agency to enable a waste disposal classification to be made. The date of implementation of this Waste Acceptance Criteria (WAC) testing was July 2005. It is this testing that will be used by the waste regulatory authorities, including waste disposal sites, to designate soils for disposal in landfill sites. In certain circumstances, to satisfy the waste regulations, there may be the necessity to carry out additional testing to clarify and confirm the nature of any contamination that may be present. If commercial requirements are significant then this process may also necessitate further field operations to clarify the extent of certain features. Thus, the waste classification must be obtained from the waste regulation authorities or a licensed waste disposal site and we strongly recommend that this classification is obtained as soon as possible and certainly prior to establishing any costings or procedures for this or related aspects of the scheme.

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russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 14-26153

Site Reference:	26, Lower Merton Rise, London NW3 3SP
Project / Job Ref:	9551 / AW
Order No:	9551/AW
Sample Receipt Date:	31/10/2014
Sample Scheduled Date:	31/10/2014
Report Issue Number:	1
Reporting Date:	06/11/2014

Authorised by:

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On behalf of QTS Environmental Ltd

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4480

Soil Analysis Certificate						
QTS Environmental Report No: 14-26153	Date Sampled	23/10/14	23/10/14	23/10/14	23/10/14	23/10/14
Soil Consultants Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 26, Lower Merton Rise, London NW3 3SP	TP / BH No	WS1	WS1	WS1	WS1	WS2
Project / Job Ref: 9551 / AW	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 9551/AW	Depth (m)	0.50	0.80	2.70	4.40	0.50
Reporting Date: 06/11/2014	QTSE Sample No	124076	124077	124078	124079	124080

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	7.6	7.5	7.6	7.3	6.2
Electrical Conductivity	uS/cm	< 5	NONE	245				378
Total Cyanide	mg/kg	< 2	NONE	< 2				< 2
Total Sulphate as SO_4	mg/kg	< 200	NONE	1285	761	643	1701	2016
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.04	0.09	0.17	0.59	0.48
Total Sulphur	mg/kg	< 200	NONE	420	478	222	563	662
Organic Matter	%	< 0.1	NONE	2.4				< 0.1
Arsenic (As)	mg/kg	< 2	MCERTS	13				17
W/S Boron	mg/kg	< 1	NONE	< 1				1.8
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5				0.7
Chromium (Cr)	mg/kg	< 2	MCERTS	28				28
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				< 2
Copper (Cu)	mg/kg	< 4	MCERTS	76				67
Lead (Pb)	mg/kg	< 3	MCERTS	434				1110
Mercury (Hg)	mg/kg	< 1	NONE	< 1				1.7
Nickel (Ni)	mg/kg	< 3	MCERTS	18				21
Selenium (Se)	mg/kg	< 3	NONE	< 3				< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	234				352
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS	50				< 6

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis (S)

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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
QTS Environmental Report No: 14-26153	**Date Sampled**	23/10/14	23/10/14	23/10/14		
Soil Consultants Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: 26, Lower Merton Rise, London NW3 3SP	**TP / BH No**	WS2	WS2	WS2		
Project / Job Ref: 9551 / AW	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 9551/AW	**Depth (m)**	0.80	1.80	2.90		
Reporting Date: 06/11/2014	**QTSE Sample No**	124081	124082	124083		

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	6.4	7.0	7.1		
Electrical Conductivity	uS/cm	< 5	NONE					
Total Cyanide	mg/kg	< 2	NONE					
Total Sulphate as SO_4	mg/kg	< 200	NONE	1060	522	1127		
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.90	0.24	0.36		
Total Sulphur	mg/kg	< 200	NONE	411	< 200	382		
Organic Matter	%	< 0.1	NONE					
Arsenic (As)	mg/kg	< 2	MCERTS					
W/S Boron	mg/kg	< 1	NONE					
Cadmium (Cd)	mg/kg	< 0.5	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	NONE					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 3	NONE					
Zinc (Zn)	mg/kg	< 3	MCERTS					
Total Phenols (monohydric)	mg/kg	< 2	NONE					
EPH (C10 - C40)	mg/kg	< 6	MCERTS					

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 14-26153	**Date Sampled**	23/10/14	23/10/14			
Soil Consultants Ltd	**Time Sampled**	None Supplied	None Supplied			
Site Reference: 26, Lower Merton Rise, London NW3 3SP	**TP / BH No**	WS1	WS2			
Project / Job Ref: 9551 / AW	**Additional Refs**	None Supplied	None Supplied			
Order No: 9551/AW	**Depth (m)**	0.50	0.50			
Reporting Date: 06/11/2014	**QTSE Sample No**	124076	124080			

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	0.13	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	0.96	< 0.1			
Anthracene	mg/kg	< 0.1	MCERTS	0.16	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	1.55	0.23			
Pyrene	mg/kg	< 0.1	MCERTS	1.44	0.20			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.67	< 0.1			
Chrysene	mg/kg	< 0.1	MCERTS	0.74	0.14			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.76	0.18			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.25	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.59	< 0.1			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.39	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.35	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	8	< 1.6			

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-26153	
Soil Consultants Ltd	
Site Reference: 26, Lower Merton Rise, London NW3 3SP	
Project / Job Ref: 9551 / AW	
Order No: 9551/AW	
Reporting Date: 06/11/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
124076	WS1	None Supplied	0.50	14.1	Grey loamy clay with rubble and stones
124077	WS1	None Supplied	0.80	15	Grey sandy clay with rubble
124078	WS1	None Supplied	2.70	19.3	Light brown clay
124079	WS1	None Supplied	4.40	19.8	Light brown clay
124080	WS2	None Supplied	0.50	17.2	Grey loamy clay
124081	WS2	None Supplied	0.80	16.8	Grey sandy clay with rubble
124082	WS2	None Supplied	1.80	18.2	Light brown clay
124083	WS2	None Supplied	2.90	18.7	Light brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 14-26153

Soil Consultants Ltd

Site Reference: 26, Lower Merton Rise, London NW3 3SP

Project / Job Ref: 9551 / AW

Order No: 9551/AW

Reporting Date: 06/11/2014

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

D Dried
AR As Received

Site Location	26, Lower Merton Rise, Camden, London NW3 3SP	Report No: 9551/AW

SITE PLAN

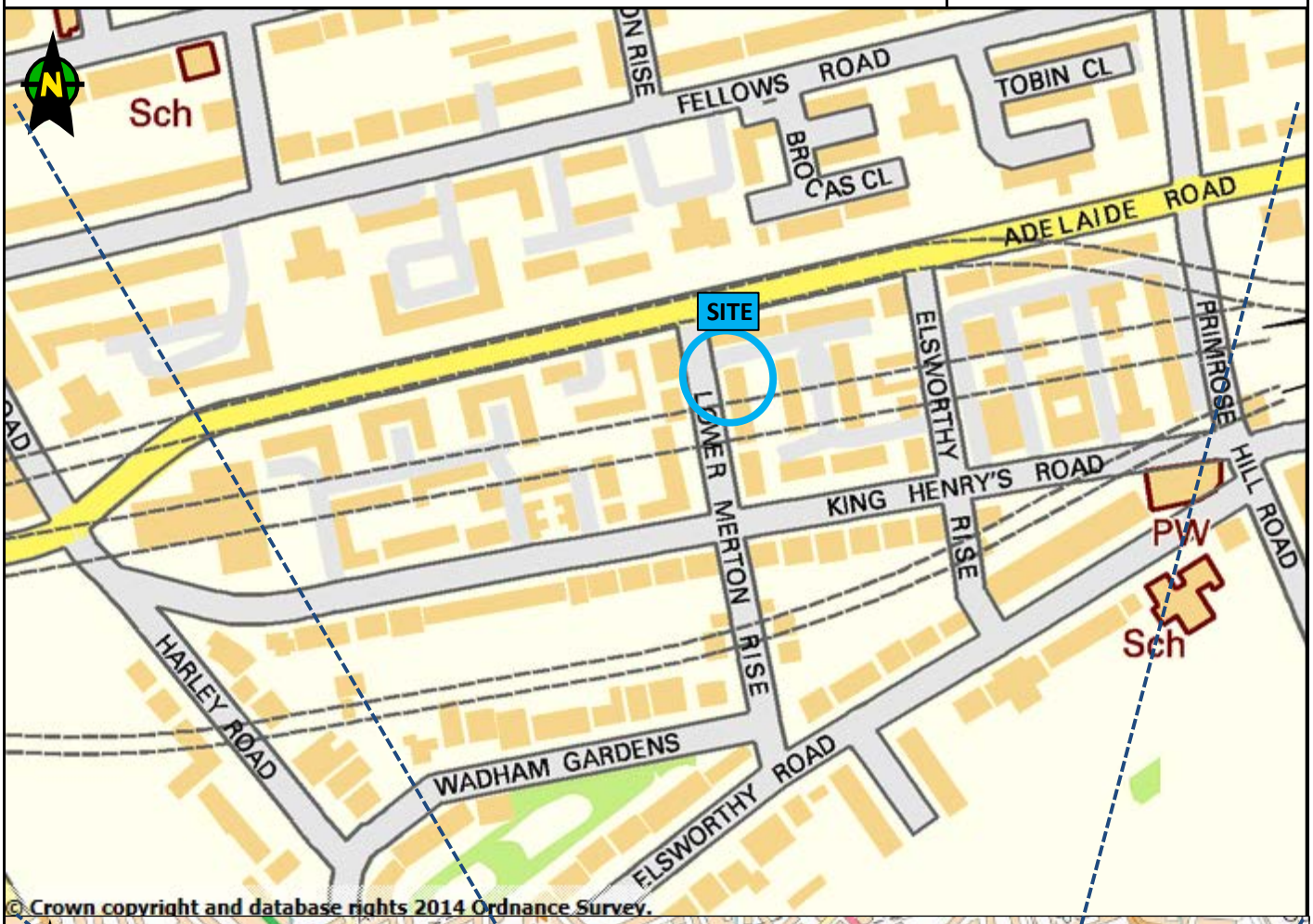
KEY

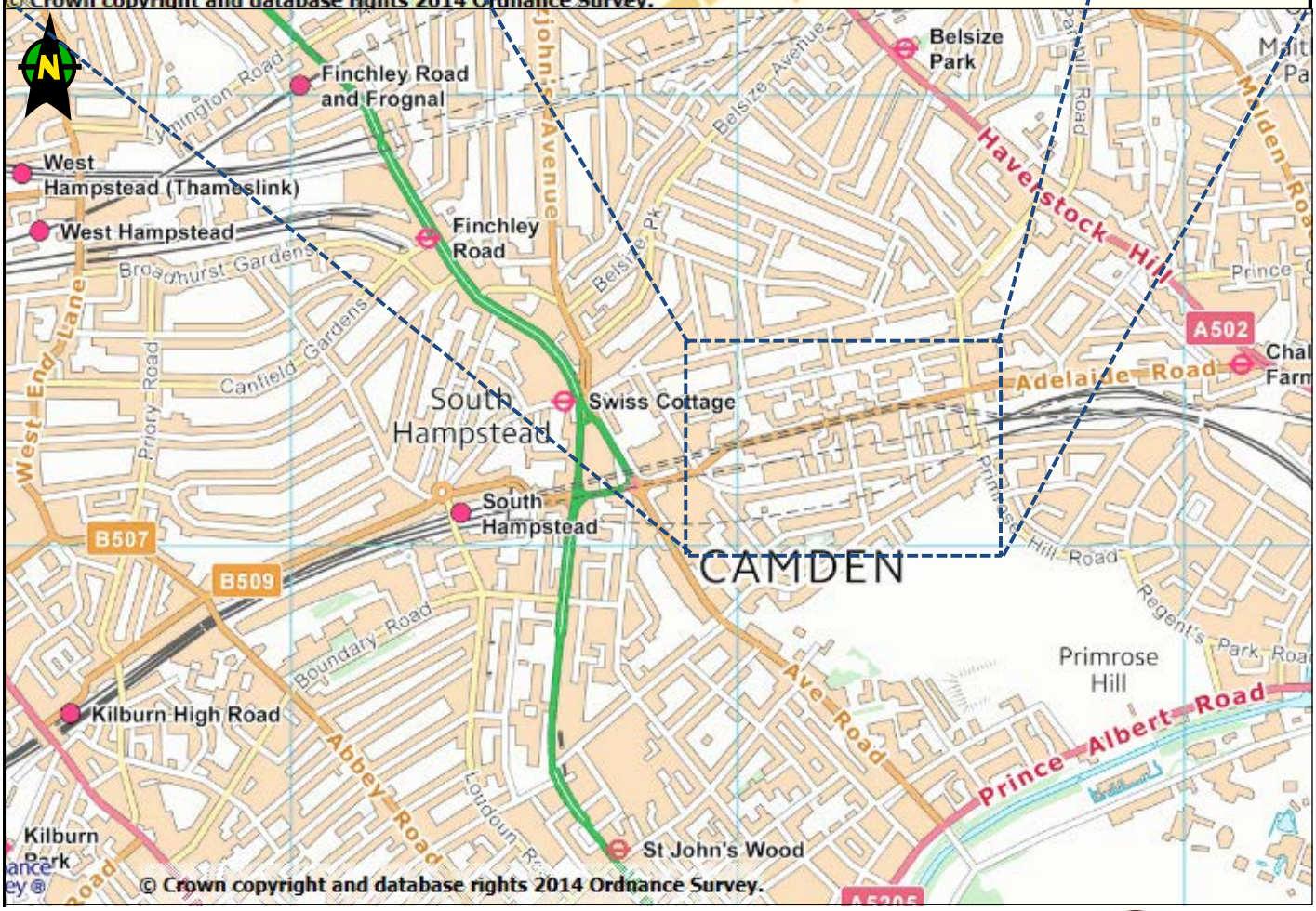
Window sample borehole
23rd October 2014

Not to scale

Soil Consultants

Site Location	26, Lower Merton Rise, Camden, London NW3 3SP	Report No: 9551/AW





Appproximate NGR 530690E 175900N

Soil Consultants

APPENDIX C

Proposed development plans, July 2017

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NOTES:

REVISIONS:
A-basement enlarged

PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

Scale:
1:100 @ A3

Date:
02.06.17

DRAWING TITLE:
REAR ELEVATION
as Proposed

Dwg No:
LMR26/2-PP2

Rev:
A

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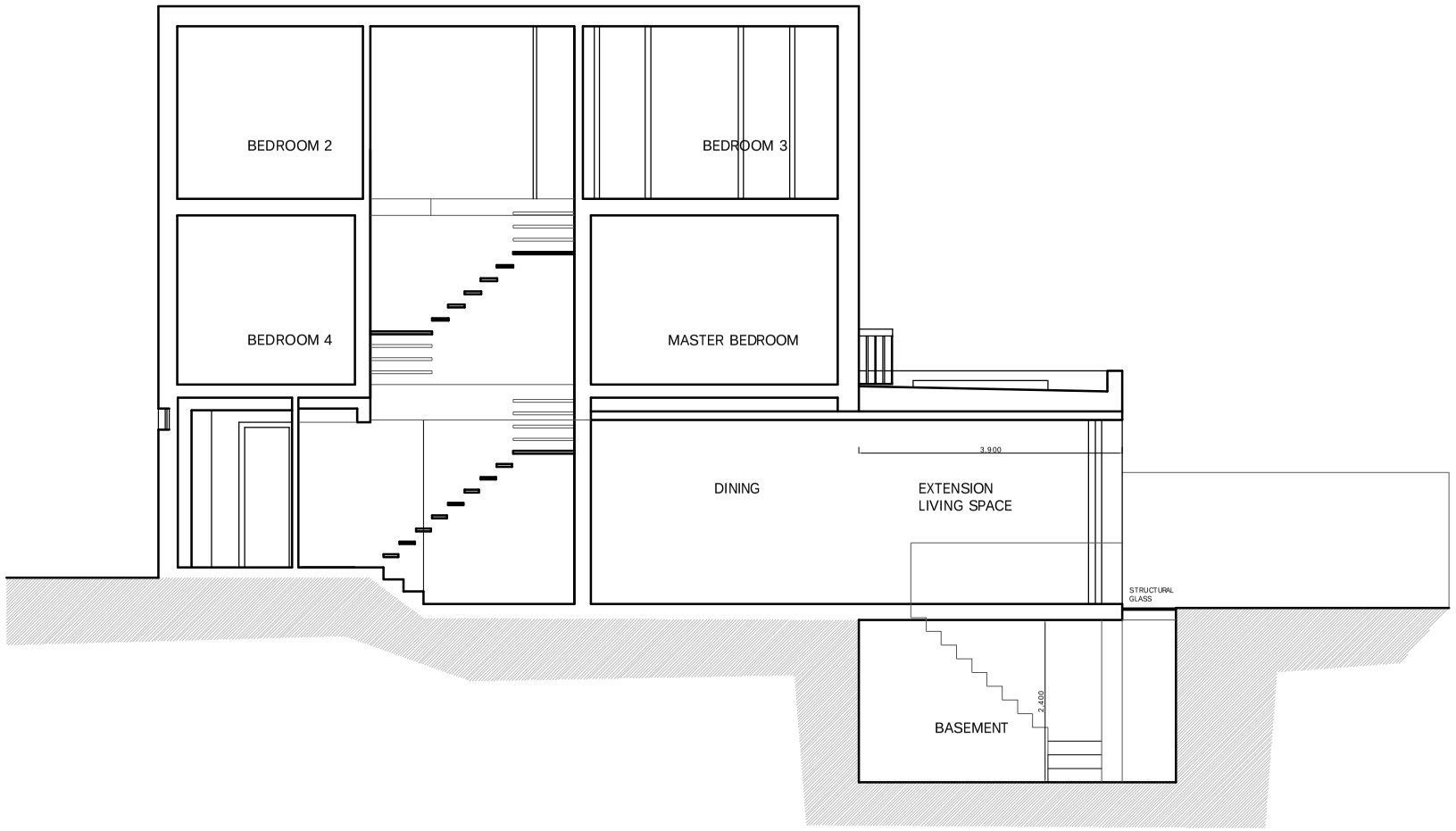

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NOTES:

REVISIONS:
A-basement enlarged

PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

Scale:
1:100 @ A3

Date:
02.06.17

DRAWING TITLE:
LONG SECTION A-A
as Proposed

Dwg No:
LMR26/2-PP3

Rev:
A

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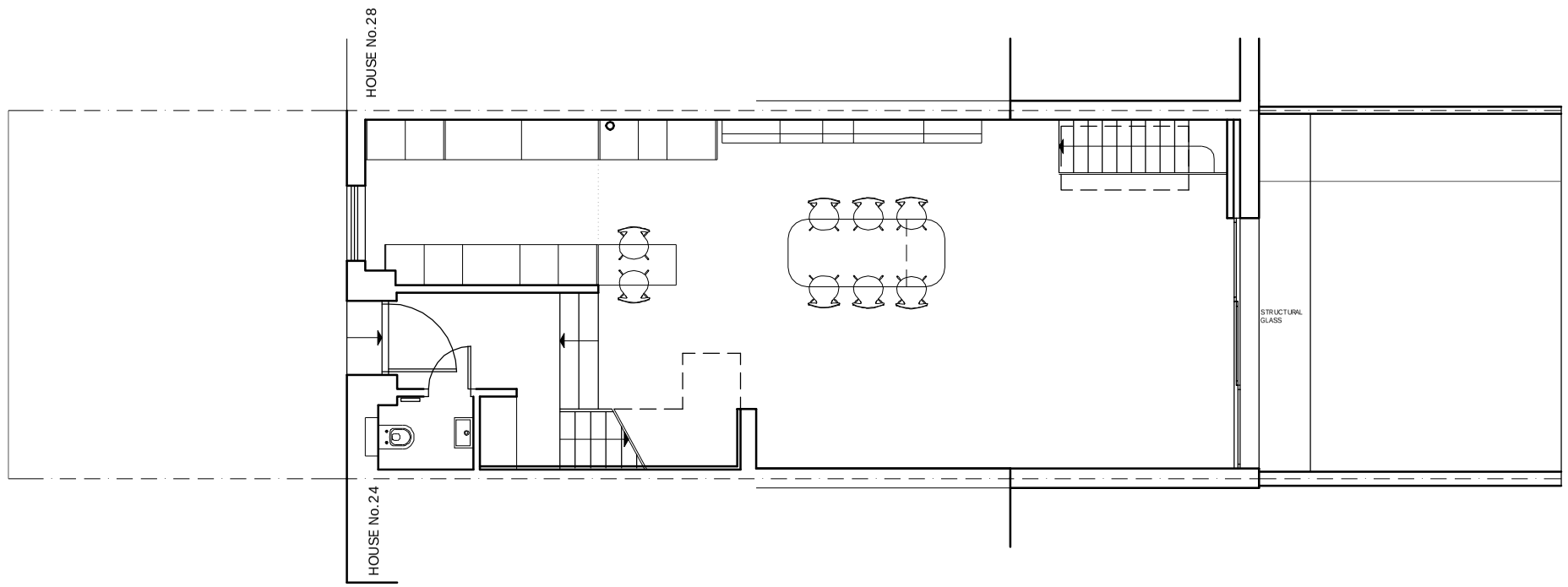

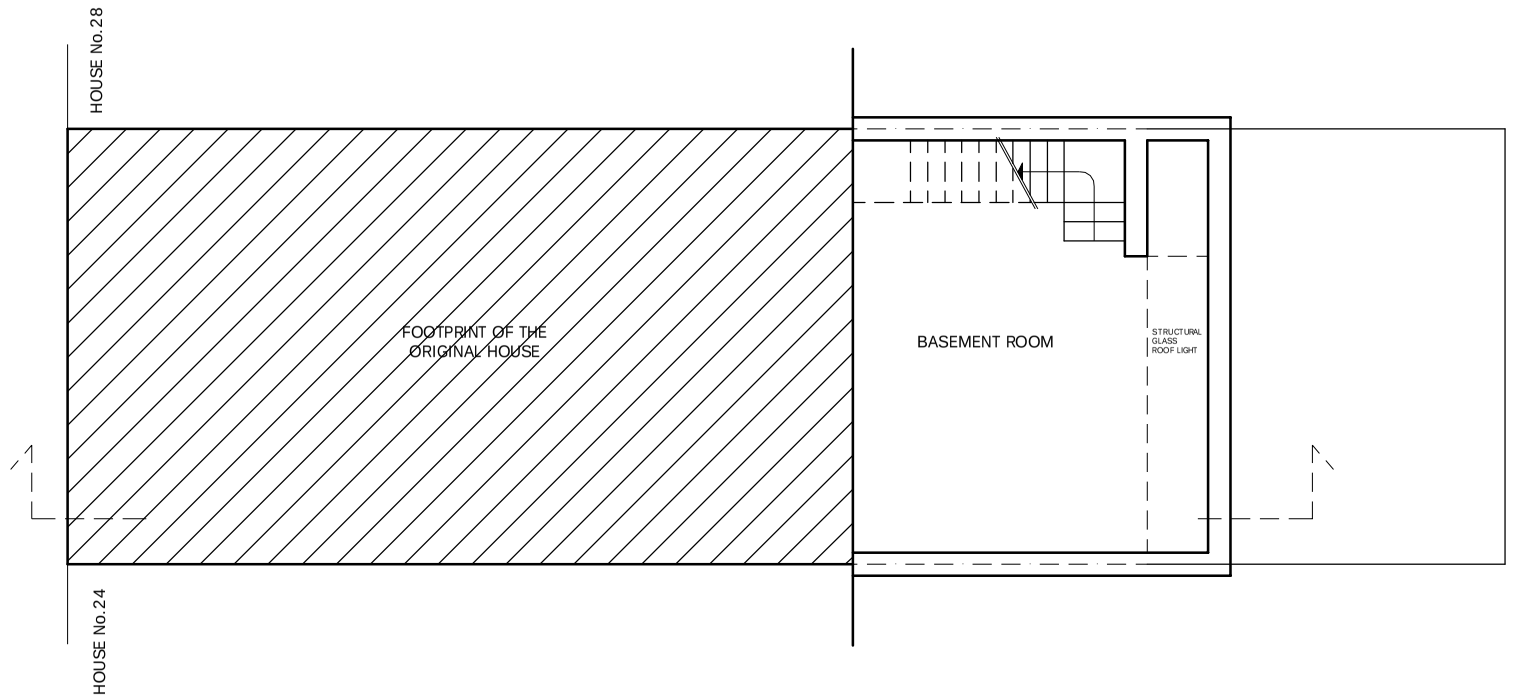

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NOTES:

REVISIONS:
A - basement enlarged

PROJECT:
26 LOWER MERTON RISE
LONDON NW3 3SP

Scale:
1:100 @ A3

Date:
02.06.17

DRAWING TITLE:
GROUND & BASEMENT FLOOR PLAN
as Proposed

Dwg No:
LMR26/2-PP4

Rev:
A

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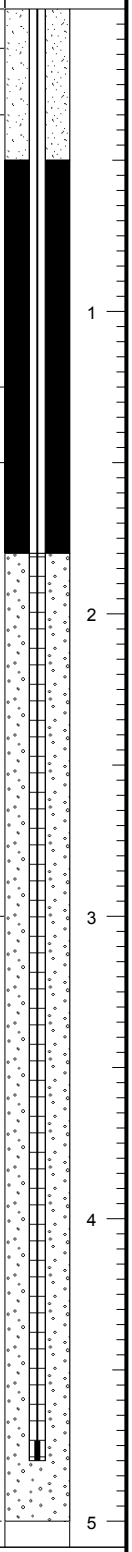
APPENDIX D

Engineering logs, Soil Consultants, November 2014

Site & Location:	**26, Lower Merton Rise** **Camden, London NW3 3SP**	Borehole No:	**WS1**
Client:	**Richard Max**	Coords (E/N):	527280.00 - 184245.00
Engineer:	**ESI Ltd**	Ground Level (m):	51.62
		Sheet 1 of 1	
		Report No:	9551/AW

Progress & Observations	Samples & Tests Type	Samples & Tests Depth (m)	Field Test Results	Strata Depth (m)	Strata Level (m)	Legend	Strata Description	Backfill / Installation
BH commenced: 23/10/14				0.13	51.49		MADE GROUND : Tile over concrete basecourse.	
							MADE GROUND : Orangish brown clayey sand and flint gravel.	
BH dia: 85mm reducing to 60mm				0.35	51.27		MADE GROUND : Stiff dark grey silty gravelly clay with rootlets. Gravel comprises flint, brick, charcoal, mortar, glass and wire. Pockets of reddish brown clayey sand.	
	PP	0.50	2.1					
	ES	0.50						
	D	0.80						
				1.25	50.37		Firm grey and orangish brown fissured CLAY with live rootlets.	
	D	1.40						
	PP	1.40	1.9	1.50	50.12		Firm orangish brown, grey and blue grey fissured CLAY with occasional calcareous concretions and with rootlets.	
	PP	1.60	1.9					
	HV	1.70	52					
	D	1.70						
	PP	1.80	1.7					
	PP	2.00	1.5					
							...live rootlets not seen below 2.10m depth	
	PP	2.20	1.8					
	HV	2.30	56					
	D	2.30						
	PP	2.40	2.4					
							...becoming stiff below 2.50m depth	
	PP	2.60	2.6					
	D	2.70						
	HV	2.70	68					
	PP	2.80	2.7				*...occasional sandy pocket at 2.80m depth*	
	PP	3.00	3.5	3.00	48.62		Stiff brown and blue grey fissured CLAY.	
	PP	3.20	3.3					
	D	3.30						
	HV	3.30	82					
	PP	3.40	3.2					
	PP	3.60	3.0					
	PP	3.80	3.6					
	D	4.00					*...with occasional orangish brown silt on fissure surfaces below 4.00m depth*	
	PP	4.00	3.6					
	HV	4.00	87					
	PP	4.20	3.2					
	PP	4.40	3.5				*...ancient decaying rootlets at 4.40m depth*	
	D	4.40						
	PP	4.60	3.4					
Groundwater not encountered	HV	4.80	110					
	PP	4.80	3.3					
	D	4.80						
	PP	4.90	3.4	5.00	46.62		End of borehole at 5.00 m	



Key: U = Undisturbed B = Bulk D = Small disturbed W = Water E = glass jar & plastic tub SPT/S = split spoon SPT/C = solid cone HV = Hand Vane [kPa]

PP = Pocket Penetrometer [kg/cm2] PID = Photo Ionisation Detector [ppmv]

Borehole type: Window Sampler

Remarks :- Hand excavation to 0.35m completed by others prior to drilling. Standpipe 35mm dia installed to 4.80m on completion, slotted with gravel filter 1.80m to 4.80m, bentonite seal 0.35m to 1.80m, original trial pit to be backfilled by others.

Borehole No: **WS1**

[* = full SPT penetration not achieved - see summary sheet]

Soil Consultants

Site & Location:	**26, Lower Merton Rise** **Camden, London NW3 3SP**	Borehole No:	**WS2**
Client:	**Richard Max**	Coords (E/N):	527260.00 - 184240.00
Engineer:	**ESI Ltd**	Ground Level (m):	51.85
		Sheet 1 of 1	
		Report No:	9551/AW

Progress & Observations	Samples & Tests Type	Samples & Tests Depth (m)	Field Test Results	Strata Depth (m)	Strata Level (m)	Legend	Strata Description	Backfill / Installation
BH commenced: 23/10/14				0.07	51.78		MADE GROUND : Block paving.	
							MADE GROUND : Orangish brown clayey sand and flint gravel.	
				0.24	51.61		MADE GROUND : Grey sand and flint gravel.	
BH dia: 85mm reducing to 60mm				0.45	51.40			
	ES	0.50					MADE GROUND : Dark grey clayey ashy gravelly sand / sandy ashy gravelly clay with rootlets. Gravel comprises brick, flint, occasional mudstone, mortar and glass.	
	D	0.80						
				0.95	50.90		MADE GROUND : Brown gravelly clay. Gravel comprises brick, flint and charcoal.	
				1.20	50.65			
	PP	1.25	1.9				Firm oranghish brown and blue grey fissured CLAY with occasional flint gravel and calcareous concretions and with rootlets.	
	D	1.25						
	PP	1.50	2.0					
	PP	1.70	1.5					
	D	1.80						
	HV	1.80	51				*…infested with live rootlets at 1.80m depth*	
	PP	1.90	2.2					
							…becoming stiff below 2.00m depth	
	PP	2.10	2.9					
	D	2.30					*…live rootlets not seen below 2.30m depth*	
	PP	2.30	2.4	2.40	49.45		*…becoming light orange brown and very silty below 2.30m depth*	
	PP	2.50	2.6				Stiff brown and blue grey fissured CLAY with fine selenite crystals.	
	HV	2.50	76					
	PP	2.70	2.9					
	HV	2.90	72					
	D	2.90						
	PP	2.90	3.0					
	PP	3.10	2.9					
	PP	3.30	2.6					
	PP	3.50	3.9					
	D	3.50						
	HV	3.50	73					
	PP	3.70	3.5					
	PP	3.90	3.1				*…ancient decaying rootlet at 3.90m depth*	
							…with occasional orangish brown silt on fissure surfaces below 3.90m depth	
	PP	4.10	4.0					
	D	4.10						
	PP	4.30	3.7					
	D	4.50						
	PP	4.50	4.2					
	HV	4.50	92					
	PP	4.70	4.0					
Groundwater not encountered								
	PP	4.90	4.9					
				5.00	46.85		End of borehole at 5.00 m	

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water E = glass jar & plastic tub SPT/S = split spoon SPT/C = solid cone HV = Hand Vane [kPa]

PP = Pocket Penetrometer [kg/cm2] PID = Photo Ionisation Detector [ppmv]

Borehole type: Window Sampler

Remarks :- Hand excavation to 0.24m completed by others prior to drilling. Standpipe 35mm dia installed to 4.94m on completion, slotted with gravel filter 1.94m to 4.94m, bentonite seal 0.35m to 1.94m, block paving replaced loose at surface.

Borehole No: **WS2**

[* = full SPT penetration not achieved - see summary sheet]

APPENDIX E

Purging results, June 2017

Borehole Purging

26 Lower Merton Rise: Basement Impact Assessment Additional Works

62274.00.01

8th June 2017

Site Engineer	Checked by
Morgan Singleton-Fookes	HCV

WS1 - Rear

Time (min)	Water level (m bgl)	h/h0
0	4.69	1.00
0.5	4.66	0.99
1	4.63	0.99
2	4.61	0.98
4	4.58	0.98
7	4.55	0.97
10	4.54	0.97
15	4.51	0.96
20	4.48	0.96
30	4.46	0.95
45	4.44	0.95
60	4.42	0.94
90	4.37	0.93
120	4.33	0.92
180	4.30	0.92
240	4.26	0.91

Water level before test	1.44
Base of well	4.71

WS2 - Front

Time (min)	Water level (m bgl)	h/h0
0	4.74	1.00
0.5	4.67	0.99
1	4.59	0.97
2	4.57	0.96
4	4.54	0.96
7	4.51	0.95
10	4.49	0.95
15	4.46	0.94
20	4.44	0.94
30	4.42	0.93
45	4.38	0.92
60	4.35	0.92
90	4.30	0.91
120	4.23	0.89
180	4.05	0.85
240	3.89	0.82

Water level before test	1.23
Base of well	4.86