

**Basement Impact
Assessment Audit**

**Highgate School Dyne House
and Island Site**

For
London Borough of Haringey

Project No.
13979

Date
September 2023

Campbell Reith Hill LLP
15 Bermondsey Square
London
SE1 3UN

T: +44 (0)20 7340 1700
E: london@campbellreith.com
W: www.campbellreith.com

DOCUMENT HISTORY AND STATUS

Revision	Date	Purpose/ Status	File Ref	Author	Check	Review
P1	August 2023	For comment	13979-02-CRH-XX-XX-GE-R- Dyne House BIA Audit-D1.docx	SS	EMB	EMB
P2	September 2023	For comment	13979-02-CRH-XX-XX-GE-R-Dyne House BIA Audit-P2.docx	SS	EMB	EMB
P3	October 2023	For comment	13979-02-CRH-XX-XX-GE-R-Dyne House BIA Audit-P3.docx	SS	EMB	EMB

This document has been prepared in accordance with the scope of Campbell Reith Hill LLP's (CampbellReith) appointment with its client and is subject to the terms of the appointment. It is addressed to and for the sole use and reliance of CampbellReith's client. CampbellReith accepts no liability for any use of this document other than by its client and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of Campbell Reith Hill LLP. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole. The contents of this document are not to be construed as providing legal, business or tax advice or opinion.

© Campbell Reith Hill LLP 2023

Document Details

Last Saved	05/10/2023 16:55
Author	Sam Savery, BSc MSc CGeol FGS
Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	13979
Project Name	Basement Impact Assessment Audit
Revision	P3
Planning Reference	HGY/2023/0328
File Ref	13979-02-CRH-XX-XX-GE-R- Dyne House BIA Audit-P3.docx

CONTENTS

1.0	NON-TECHNICAL SUMMARY	4
2.0	INTRODUCTION.....	6
3.0	BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST	8
4.0	DISCUSSION	12

APPENDICES

Appendix 1: Consultation Responses

Appendix 2: Audit Query Tracker

Appendix 3: Supplementary Supporting Documents

1.0 NON-TECHNICAL SUMMARY

- 1.1 CampbellReith was instructed by London Borough of Haringey, (LBH) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for Dyne House, Southwood Lane, Hornsey, London, N6 5EE (planning reference HGY/2023/0328).
- 1.2 The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development. It was agreed that the audit would follow the procedure presented in the Camden Planning Guidance: Basements.
- 1.3 The proposals include the redevelopment and extension of Dyne House comprising the excavation of a one-level basement and construction of a five-storey structure; the demolition and replacement of the Gym and Geography Building with a one- to two-level structure with one- to three-level basement (Rear Block); the demolition of the existing structure on the Island plot, excavation of a one-storey basement and construction of a two-storey structure over.
- 1.4 Screening and scoping assessments are presented, supported by desk study and intrusive ground investigation information.
- 1.5 Evidence for the qualifications and expertise of the individuals involved in the production of the BIA and supporting documents is not provided.
- 1.6 The Construction Methodology and Management Plan (CMMP) contains a logistics plan and partial description of the basement construction method proposals. Outline structural information is not provided.
- 1.7 The BIA has confirmed all basements will be found in the natural strata. The ground model does not consider all the information available.
- 1.8 The BIA states the site has a very low flood risk, whilst the hydrogeological study states the risk of flooding from surface water over the Dyne House site footprint is classified as medium.
- 1.9 A drainage strategy has been submitted and accepted by LBH Flood & Water management team.
- 1.10 The BIA indicates that construction of the proposed Rear Block basement may result in a rise in groundwater table surface of approximately 2m behind the proposed basement. The hydrogeological assessment is based on superseded scheme information and the audit has raised other queries (see Section 4). The conclusions of the hydrogeological assessment require further justification.
- 1.11 A Ground Movement Assessment has been undertaken to assess the impact on the neighbouring properties. Slope stability and the impact of tree removal are also assessed. The assessment indicates damage to surrounding the buildings will not exceed Burland Category 1 (Very Slight). However, additional information is required to confirm the findings.

- 1.12 The public highway Southwood Lane road divides the Dyne House and Island sites. Impacts to the highway should be confirmed.
- 1.13 A number of technical objections have been raised by neighbours to the scheme, many of which correspond with queries raised by this audit. These are discussed in Section 4 and Appendix 1 of this audit.
- 1.14 It cannot be confirmed that the BIA demonstrates the scheme maintains the stability of the host building, neighbouring properties and adjoining highways; and does not adversely affect the water environment.

2.0 INTRODUCTION

2.1 CampbellReith was instructed by London Borough of Haringey (LBH) on 9th August 2023 to carry out an audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Dyne House and Island Site, Highgate School, Southwood Lane, London N6 5EE, reference HGY/2023/0328.

2.2 The audit reviewed the BIA for potential impact on land stability and local ground and surface water conditions arising from basement development. An audit of land quality/contamination issues has not been undertaken and is outside the scope of this report.

2.3 A BIA is required for all planning applications with basements in Haringey in general accordance with policies and technical procedures contained within

- Development Management DPD. July 2017.
- Draft Basement Development Guidance Note. June 2012.

2.4 The BIA should demonstrate that schemes:

- a) maintain the structural stability of the building, neighbouring properties and adjoining highways;
- b) does not increase flood risk to the property and nearby properties;
- c) avoid adversely affecting drainage and run off or causing other damage to the water environment;
- d) avoid cumulative impacts upon structural stability or the water environment in the local area;

and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability and to make recommendations for the detailed design.

2.5 Although the site lies within the London Borough of Haringey Council, it was agreed that the audit of the screening, scoping and impact assessment would follow the procedure presented in the Camden Planning Guidance: Basements as it is widely known and is considered to provide a robust approach to the issues of concern.

2.6 The site is within the Highgate Neighbourhood Area.

2.7 LBH's Application for Planning Permission described the planning proposal as "*Redevelopment of Dyne House*", to include:

- Retention, refurbishment and extension of the principal five storey Dyne House structure (plus plant and lift over run);
- Demolition and redevelopment of the rear extension and associated buildings with a part one, part two storey structure;
- Retention of the Parade Ground open space, with new multi-use surface;

- Associated improvements to the Island Site access and underground tunnel, including demolition and redevelopment of service block; and
- Associated landscaping and improved provision for emergency services, servicing and disabled parking.

2.8 The BIA confirmed Dyne House and the Island Site involve, and are neighbour to, listed buildings.

2.9 CampbellReith accessed LBH's Planning Portal on 10th August 2023 and gained access to the following relevant documents for audit purposes:

- Highgate School Dyne House and Island Site Basement Impact Assessment (BIA) by Expedition Engineering Ltd. Ref. EXP-REP-404-001 Rev. 00. Dated 16th January 2023.
- Existing and Proposed Drawings (Appendix B of BIA).
- Construction Methodology and Management Plan (Appendix D of the BIA).
- Dyne House & Dyne House Tunnel Link building on the Island Site Highgate School. Sustainable Urban Drainage Statement by Expedition Engineering Ltd. Issue 00. Dated 16th January 2023.
- Highgate School. Dyne House & Island Site Tunnel Building. Design & Access Statement by Hopkins Architects. Ref A_HS-DH3_9350_D. Rev. D. Dated 13th January 2023.
- Dyne House & Dyne House Tunnel Link Building on the Island Site – Flood Risk Note for Planning) by Expedition Engineering Ltd. Issue 0. Dated 16th January 2023.
- Highgate School Campus Flood Risk Assessment by Edenvale Young, Project No EVY0753, revision B, dated 23 January 2023.

2.10 On 17th August 2023, Highgate School advised CampbellReith that a hydrogeological report they had commissioned was not on the website and provided it by email (Highgate School Dyne House – Hydrogeological Desk Study Report by Expedition Engineering Ltd. Ref.0063-RPT-001. Rev 01. Dated 16th July 2015).

2.11 The audit identified that the BIA on the planning website was not complete (Part 5 missing). This has since been rectified. However, in the meantime, a full copy of the BIA was provided CampbellReith by Highgate School by on 24th August 2023.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Do BIA Author(s) credentials comply with CPG?	No	BIA section 2.2. No evidence of input by hydrogeologist and civil engineer (surface water) .
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	No	Outline structural arrangements noted in the BIA as being presented (para 2.6.7) are not provided.
Are suitable plan/maps included	Yes	Appendix B of BIA
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.2 of BIA.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.1 of BIA.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 3.3 of BIA
Is a conceptual model presented?	Yes	Figure 5.2 of BIA. Model does not include Alluvium identified during intrusive investigation.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	Section 4.2 of BIA. Presence of spring lines not carried forward to scoping. Extent of embedded wall cut-off to be confirmed.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	No	Section 4.1 of BIA. Presence of spring lines not carried forward to scoping.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4.3 of BIA
Is factual ground investigation data provided?	Yes	Section 5 and Appendix D of BIA
Is monitoring data presented?	Yes	Groundwater monitoring data presented is from 2015.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	No	For school buildings only.
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural, hydrogeological, flood risk and surface water drainage assessments and strategies presented on planning website.

Item	Yes/No/NA	Comment
Are the baseline conditions described, based on the GSD?	No	Groundwater monitoring data is > 8 years old.
Do the baseline conditions consider adjacent or nearby basements?	Yes	For school buildings only.
Is an Impact Assessment provided?	Yes	Section 8 of the BIA
Are estimates of ground movement and structural impact presented?	Yes	Structural impacts provided in Section 8 and Appendix C of the BIA. Further information is required to justify the conclusions.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	No	Further information to be provided to support stability and hydrogeology assessments.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	To be confirmed on receipt of further information.
Has the need for monitoring during construction been considered?	Yes	Paragraph 4.5.10 of the BIA
Have the residual (after mitigation) impacts been clearly identified?	No	Building damage assessment and hydrogeological assessment require further justification.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Not demonstrated.

Item	Yes/No/NA	Comment
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	Not demonstrated.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However, further information required to support building damage assessment.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

- 4.1 The Basement Impact Assessment (BIA) has been carried out by A-squared Studio Engineers Ltd on behalf of Expedition Engineering Ltd. The individuals concerned in its production are both chartered structural engineers and their qualifications comply with CPG: Basements for land stability. The BIA is supported by a Hydrogeological Study, an FRA and a SUDs Statement; evidence for relevant expertise of the authors for all three documents is not provided.
- 4.2 The development is part of Highgate School and is divided into three plots: Dyne House, Gym and Geography Building (Rear Block), and The Island. The combined Dyne House and Gym and Geography Building plots measure approximately 0.56ha. The site lies on a hillside and the ground level within the combined plot varies from approximately 126mOD in the west to 111mOD in the east with an overall gradient of 8°. The Island plot to the west is separated from Dyne House by Southwood Lane. This is a smaller plot measuring 0.02ha and is relatively flat and level at approximately 126mOD. The sites are connected by a link tunnel beneath Southwood Lane.
- 4.3 Proposals include the redevelopment and extension of Dyne House comprising excavation to 4m bgl for a one-level basement and construction of a five-storey RC frame structure; the demolition and replacement of the Gym and Geography Building with a one- to two-level structure with one- to three-level basement with excavation depths between 4m and 11m bgl, referred to as the 'Rear Block'; the demolition of the existing structure on the Island plot, excavation to 4.50m bgl for a one-storey basement, and construction of a two-storey RC structure.
- 4.4 The BIA states "There are several listed buildings within the zone of influence of the proposed development, including the Highgate School Old School Building (Grade II Listed), Nos. 4 to 22 Southwood Lane (Grade II Listed residential properties), Highgate School Chapel (Grade II Listed), and the Highgate Tabernacle (Grade II Listed)."
- 4.5 A desk top study and intrusive ground investigation had been undertaken in 2015 prior to the preparation of the BIA. The BIA confirms the site is underlain by Made Ground to depths of between 1.00m and 1.50m below ground level (BGL), below which lies Bagshot Formation to depths of between 6.00m and 11.50m depth BGL, followed by the Claygate Member. The site stratigraphy varies from west to east, as shown in the cross-section Figure 5.2 of the BIA. There is a reduction in thickness of the Bagshot Formation from west to east, following the slope of the ground surface. Stratum depths illustrated in Figure 5.2 are incorrect, specifically BH5 Made Ground, and the ground model does not consider the Alluvium identified in the exploratory holes.
- 4.6 Standpipe monitoring was carried out in 2015 and is reported to have encountered a perched water table in the Bagshot Formation and Claygate Member, at depths of between 7.80m and 8.20m BGL (117.50mOD), and 5.10m and 5.60m BGL (c.105m OD) respectively. It is noted that no standpipes or piezometers were installed in the east of the site within the Parade Ground area.

- 4.7 Whilst the conceptual model presented describes the relationship between the soil strata and the proposed development, it does not include groundwater levels or groundwater pathways.
- 4.8 The FRA contains information relating to a ground investigation undertaken at the site in 2018. Whilst the factual data is not provided, the ground investigation report contains further information relating to the ground and groundwater conditions which has not been considered in the ground model and subsequent assessments.
- 4.9 The subterranean (groundwater flow) screening confirms the site is underlain by Secondary 'A' Aquifers, both the Bagshot Formation and Claygate Member. The boundary between the Bagshot Formation and Claygate Member, which crosses the site, is a potential spring line. The proposed Rear Block basement in the east of the Dyne House site will extend beneath the water table surface potentially affecting the groundwater regime by acting as a deep obstruction and causing damming. It is reported that the other proposed basements will not extend beneath the water table surface. The presence of a potential spring line was not taken forward to scoping.
- 4.10 A number of trees will be felled to accommodate the proposed development. The Claygate Member and London Clay strata are classified as having a high-volume change potential therefore there is potential risk of shrink-swell subsidence due to removal of trees and seasonal variations in groundwater table.
- 4.11 Other potential impacts identified in the stability screening include the previously worked ground in eastern sections, proposed excavations adjacent to public highways and neighbouring structures, and the increase the differential depth between the proposed basement and foundations of neighbouring properties. In addition, a Thames Water sewer passes directly through the site between the current Dyne House and Geography Building. This is subject to a separate impact assessment and approvals process.
- 4.12 Surface water and flooding screening confirms the development will increase the amount of hardstanding areas. The BIA states the site has a very low flood risk, although this is contradicted by the Hydrogeological Study which records a medium surface water risk at Dyne House.
- 4.13 The BIA advises that the scheme will maintain the existing surface water discharge conditions using attenuation methods and incorporation of suitable SuDS solutions. Potential impacts to surface water and flooding resulting from the large increase in impermeable areas are addressed by the Sustainable Urban Drainage Statement document.
- 4.14 The Flood Risk Note (FRN) by Expedition Engineering notes that it is to be read in conjunction with the BIA. The FRN concludes the site is in Flood Zone 1 and is <1ha. The Sustainable Urban Drainage Statement document, referred to below, was also issued by Expedition Engineering.

- 4.15 The Sustainable Urban Drainage Statement document describes drainage strategies to avoid an increase to the surface water flood risk and offsite flows to the sewer network, and states Thames Water will support the current proposal concerning a combined sewer diversion although re-engagement with Thames Water is required. LBH's Flood & Water Management team is satisfied with the proposals.
- 4.16 The BIA notes that outline structural arrangements prepared by Expedition are presented in Appendix D with a Construction Methodology and Management Plan (CMMP), however the structural engineering information appears to be missing. The focus of the CMMP is logistics. It provides a only high-level summary of the proposed construction methodology as outlined below.
- 4.17 For the Rear Block development, the CMMP indicates that the proposal is to construct the basement using a bottom-up methodology. The basement excavation will be restrained by embedded sheet pile retaining walls on three sides with the structure supported on bored piles constructed at lower level. The CMMP notes that ground anchors will be installed, if possible, around the eastern end of the excavation and reference is made to temporary propping for lateral support. Structural load bearing piles will comprise 650mm diameter CFA piles.
- 4.18 The CMMP states that construction for the Dyne House front basement extension will follow a top-down phased construction method using sheet piles or contiguous piles for the perimeter wall. No construction plan is presented for the smaller Island plot.
- 4.19 With respect to stability, the BIA states heave mitigation measures must be incorporated into the scheme due to the volume change potential of the Claygate Member and London Clay Formation.
- 4.20 The BIA confirms all basements will be found in the natural strata, not in the worked ground identified in the east of the site.
- 4.21 The BIA includes a Ground Movement Assessment (GMA) to estimate the impact to neighbouring structures. The BIA states a GMA will be undertaken to address the proposed excavations adjacent to public highways and third-party assets.
- 4.22 The Ground Movement Assessment (GMA) uses P-Disp and X-Disp software packages. The GMA states the upper bound damage category for surrounding structures within the zone of influence of the proposed development are within Category 1 – Very Slight, in accordance with the Burland Scale. It is requested that input and output data are presented for review.
- 4.23 It is noted that, due to the sloping site, there are significant out of balance forces around the Rear Block basement, and it is requested that justification is provided to demonstrate that the use of the CIRIA C760 curves in X-Disp is appropriate for this scenario. It is further noted that no structural or outline scheme information is presented to support the assumptions made in the GMA such as pile lengths and temporary and permanent propping arrangements. No information on the construction methodology is presented for the Island site.

- 4.24 The BIA states that sheet piling is proposed to support the western, northern and eastern edges of the basement excavation for the rear site. The CMMP notes that the wall will be supported by anchors at its western end 'if possible'. Noting the presence of a sewer in this area, the assessment should consider outcomes in the case that the wall cannot be anchored. Additionally, the formation level is some 4m below ground level at the eastern end of the proposed rear basement. The means of supporting the excavation in this area and implications for dewatering are not described.
- 4.25 The impacts on the highway are not considered.
- 4.26 The BIA concludes that where significant changes are made to the construction sequence, temporary propping and scheme design, the impacts to surrounding buildings require to be reviewed. However, as noted above, further information is required to illustrate the construction sequence, propping arrangements and scheme design considered in the impact assessment.
- 4.27 The BIA states basement design must mitigate the effects of any potential heave and uplift pressures from the Claygate Member and London Clay Formation. Where such impacts may affect stability, clarification of the mitigation measures should be included.
- 4.28 The BIA confirms a movement monitoring strategy is required during excavation and construction.
- 4.29 The BIA advises that the basement embedded retaining walls and temporary propping will be designed by an appropriately experienced and qualified specialist/engineer to provide adequate restraint to any potential slope instability surrounding the site. The BIA includes a slope stability assessment to address the global stability. This assessment uses SLOPE software to model a range of slip surfaces and estimate ground movements. It is requested that the input and output data are submitted for review.
- 4.30 The Hydrogeological Study presents a groundwater flow assessment using PLAXIS software. A summary of the study is presented in the BIA and the full document was provided to CampbellReith by Highgate School. As noted above, the ground model presented in the BIA does not consider groundwater.
- 4.31 The study is based on 2015 groundwater monitoring data and an earlier revision of the development proposals which does not include the basements beneath the Island Site and the Dyne House extension. The BIA takes no account of seasonal effects on the groundwater table and does not consider later available groundwater data. It is further noted that there is no groundwater data for the east of the site. The assessment indicates that construction of the proposed Rear Block basement may result in a rise in groundwater table surface of approximately 2m behind the proposed basement and between 0.50m and 2m on either side.

- 4.32 The BIA concludes that the basements proposed in the current scheme will not alter the assessment findings. This requires further justification. The adopted groundwater level from 2015 is approximately 3m below the proposed basement at the front of Dyne House. Considering the potential for a 2m groundwater level rise due to the basement of the rear block, and allowing for seasonal variation, could result in the front basement level being below the water table.
- 4.33 The BIA notes that predicted groundwater level rises in the vicinity of neighbouring properties are between 0.50 and 0.90m and that the change to the local groundwater regime is expected to have a limited effect on the neighbouring properties. However, it subsequently says that further assessment is proposed to determine the effect of a rise in groundwater level on any nearby below-ground structures and utilities, should they be present. This concurs with the hydrogeological study which recommends that the "presence and extent of any existing below ground structures be ascertained in order to enable a site/building specific impact assessment to be undertaken". Neighbouring ground levels vary and the impact of the rear basement and seasonal fluctuations could bring groundwater close to ground level locally. Presentation of a model results map with potential receptors identified would allow the impacts to be assessed.
- 4.34 The cumulative impacts of proposed and existing basements should be assessed.
- 4.35 The hydrogeological assessment does not consider the potential presence of spring lines which may fluctuate seasonally, or the extent and impacts of changes to groundwater levels in the shadow of the proposed basements. Additionally, further justification is required to support the conclusion that there are no potential impacts on groundwater flooding.
- 4.36 A number of objections have been lodged in respect of the application, including a technical objection prepared by Alan Baxter Associates (ABA) on behalf of Southwood Lane residents (see Appendix 1). This audit supports a number of ABA's queries in respect of the development. ABA suggest that not all sensitive properties have been considered in the impact assessment and this should be confirmed. A contour plan showing the results of the analyses and their impact on potentially affected properties would assist in justifying the assessment.
- 4.37 ABA suggest that a sheet piled retaining wall is not appropriate for the large basement beneath the rear site. CampbellReith is of the opinion that such a solution may be viable but is subject to further design development to demonstrate that the wall and any required props and anchors can be constructed and will provide the stability required in the temporary and permanent cases. ABA also query the use of the CIRIA C760 curves for ground movement assessments for large excavations. CampbellReith would note that the CIRIA C760 curves are based on a number of large excavations, but we would query their use on a steeply sloping site such as this.

5.0 CONCLUSIONS

- 5.1 The Basement Impact Assessment (BIA) has been carried out by A-squared Studio Engineers Ltd on behalf of Expedition Engineering Ltd. The individuals concerned in its production are chartered structural engineers but no proof of expertise in hydrogeology and flood risk has been provided.
- 5.2 The BIA identifies several listed buildings within the zone of influence of the proposed development.
- 5.3 The CMMP contains a logistics plan and partial description of the basement construction method proposals. Outline structural arrangements are not provided.
- 5.4 The ground model should be reviewed and updated where necessary to confirm the depths of Made Ground the presence of Alluvium. The ground model does not consider information from a ground investigation undertaken at the site in 2018 and does not include groundwater levels or pathways.
- 5.5 Justification for using groundwater data from 2015 should be provided and the presence of spring lines should be carried forward to scoping with any resultant impact assessed. It should also be demonstrated that the findings of 2015 hydrogeological assessment are appropriate to the new scheme with its additional basements.
- 5.6 The BIA states the site has a very low flood risk, although this is contradicted by the Hydrogeological Study which records a medium surface water risk at Dyne House. Flood risk clarification is required.
- 5.7 The SUDs Strategy has been accepted by LBH's Flood & Water Management team.
- 5.8 The BIA states that the projected rise in water levels due to basement construction will not adversely affect surrounding properties. Further justification is required to confirm this conclusion as noted in the hydrogeological study which recommends a more detailed assessment.
- 5.9 The impacts of groundwater level changes in the shadow of basements and on groundwater flooding should be confirmed.
- 5.10 Medium to high volume change potential soils were identified during the 2015 ground investigation. Impacts of potential shrink-swell on surrounding properties require further assessment and outline mitigation measures.
- 5.11 A Ground Movement Assessment indicates damage to surrounding buildings will not exceed Burland Category 1 (Very Slight). Confirmation of the proposed construction methodology and outline structural information are required to confirm the findings together with consideration of the suitability of the assessment methodology on this steeply sloping site. Impacts to the highway should be confirmed.
- 5.12 The BIA includes a slope stability assessment to address the global stability global slope stability. The input and selected output data from Slope are requested.

- 5.13 A number of technical objections have been raised by neighbours to the scheme, many of which correspond with queries raised by this audit. It cannot be confirmed that the BIA demonstrates the scheme maintains the stability of the host building, neighbouring properties and adjoining highways; and does not adversely affect the water environment until the queries raised in Section 4 and Appendix 2 are addressed.

Appendix 1

Consultation Responses

Residents' Consultation Comments

Objector	Address	Date	Issue raised	Response
Highgate Society	10A South Grove, N6 6BS	18/05/23	Claygate Formation not proven Impermeable area tripling in size Basement groundwater diversion and waterlogging Hydrogeological study based on old data and superseded scheme	See audit paragraph 4.5. See audit paragraphs 4.12 – 4.15. See audit paragraphs 4.8, 4.9, 4.31 – 4.35. See audit paragraphs 4.8, 4.9, 4.31 – 4.35.
Southwood Lane Residents Association	Given as: Southwood Lane	22/05/23	Justification for 'very slight' damage assessment for fragile buildings Use of sheet piling questionable (after Alan Baxter Associate)	See audit paragraphs 4.22 – 4.29. See audit paragraph 4.37.
Kingsley Place Residents Association	23b Kingsley Place, N6 5EA	21/04/23	Settlement and subsidence of 18 th and 19 th century properties Topographically challenging site	See audit paragraphs 4.22– 4.29. See audit paragraphs 4.23 & 4.29
Alan Baxter Associates	Not given	22/05/23	Suitability of, and ground movements associated with, sheet piling Concerns over temporary works (anchors, propping arrangements) Consideration of unbalanced loads on retaining walls Assessments based on data obtained in 2015	See audit paragraph 4.24 & 4.37. See audit paragraph 4.16, 4.24 & 4.26. See audit paragraph 4.23. See audit paragraph 4.6 – 4.8.

			Impacts of potential 2m rise in groundwater level need further consideration	See audit paragraph 4.30 – 4.35.
			Suitability of X-Disp for large basement and application of CIRIA curves for sheet piling	See audit paragraph 4.23 & 4.37.
			Not all sensitive structures assessed	See audit paragraph 4.36.

Appendix 2

Audit Query Tracker

Basement Impact Assessment Audit
Highgate School Dyne House and Island Site

Audit Query Tracker

Query No	Subject	Query	Audit Paragraph	Status	Date closed out
1	BIA	Evidence of expertise in hydrogeology and hydrology not provided	4.1		
2	BIA	Ground model requires justification or revision to reflect ground investigations of 2015 and 2018	4.5, 4.8		
3	BIA	Outline structural arrangements referred to but not provided	4.16		
4	Screening and scoping	Spring lines not taken forward to scoping	4.9		
5	Screening and scoping	Flood risk to be reported consistently and impact assessment updated where necessary	4.12		
6	Stability	Impacts of potential shrink-swell to be assessed and mitigated	4.10		
7	Stability	Input and selected output data from P-Disp, X-Disp and Slope required for audit	4.22, 4.29		
8	Stability	Suitability of X-Disp in steeply sloping ground to be confirmed	4.23		
9	Stability	Outline structural information required to support assumptions made in ground movement assessment	4.23		
10	Stability	Proposals to restrain retaining wall at prop western edge of rear basement to be confirmed.	4.24		
11	Stability	Proposals to support eastern edge of excavation beneath the Parade Ground to be confirmed	4.24		
12	Stability	Impacts on/of dewatering to be confirmed following clarification of retaining wall construction	4.24		
13	Stability	Impacts on highway to be confirmed	4.25		

Query No	Subject	Query	Audit Paragraph	Status	Date closed out
14	Stability	Confirmation that all sensitive structures assessed	4.36		
15	Hydrogeology	Ground model to be updated to include groundwater levels and pathways	4.6, 4.7, 4.30, 4.35		
16	Hydrogeology	Justification to be provided for using 2015 baseline data	4.31		
17	Hydrogeology	Justification required to support conclusion that basements beneath Dyne House and the Island site will not alter findings of 2015 assessment	4.31, 4.32		
18	Hydrogeology	Justification required to support conclusion of no impact to surrounding properties	4.33, 4.35		
19	Hydrogeology	Impacts of groundwater level changes in shadow of basements to be confirmed	4.35		

Appendix 3

Supplementary Supporting Documents

None

London

15 Bermondsey Square
London
SE1 3UN

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Bristol

Unit 5.03,
HERE,
470 Bath Road,
Bristol BS4 3AP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Campbell Reith Hill LLP. Registered in England & Wales. Limited Liability Partnership No OC300082
A list of Members is available at our Registered Office at: 15 Bermondsey Square, London, SE1 3UN
VAT No 974 8892 43