CampbellReith
consulting engineers

10 Clorane Gardens
London, NW3 7PR

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-11

Revision: F1

Date: July 2016

Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
F:+44 (0)20 7340 1777
E:london@campbellreith.com
W:www.campbellreith.com

Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	April 2016	Comment	AGPagp12336-11-130416-10 Clorane Gardens-D1.doc	A Poulton	D Thomas	E Brown
F1	July 2016	Planning	AGPagp12336-11-220716-10 Clorane Gardens-F1.doc	F Drammeh	E Brown	E Brown

Document Details

Last saved	22/07/2016 09:43
Path	AGPagp12336-11-220716-10 Clorane Gardens-F1.doc
Author	Alan Poulton, CEng IStructE
Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	12336-11
Project Name	10 Clorane Gardens
Planning Reference	2015 /6734/ P

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 10 Clorane Gardens NW3 7PR (planning reference 2015/6734/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

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 in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.1. The Basement Impact Assessment (BIA) was undertaken by Gabriel Geoconsulting Limited and the individuals concerned in its production have suitable qualifications.

1.2. The BIA has confirmed that the basement will extend down through the Made Ground, any remnant Head deposits and the underlying '*firm to stiff*', silty clays of the Claygate Member, and will be founded just below the top of the stiff, locally fissured, silty clays.

1.3. It is likely that both perched ground water and the groundwater table within the underlying clays will be encountered during basement foundation excavation. Thus, the basement is to be designed to accommodate groundwater at ground level and the construction of the basement will need appropriate temporary propping and face support to excavations, together with temporary drainage.

1.4. Calculations have been provided together with drawings indicating the underpinning bay and construction sequence respectively as requested following the initial audit to demonstrate how stability is to be maintained and support provided to the adjoining properties.

1.5. Groundwater monitoring results from two visits in November 2015 were presented within the BIA and additional monitoring was requested to establish the groundwater level. An additional groundwater monitoring visit has been undertaken and the results are included in the email response form Kyson included in Appendix 3.

1.6. Notwithstanding the ground investigation that has been undertaken, the potential for unidentified areas of higher permeability strata has been identified within the BIA and suitable further investigations need to be undertaken to confirm or disprove the presence of such strata prior to works commencing to enable the final details of the works to be confirmed.

1.7. The site investigation has shown that groundwater is present within the underlying silty clay soils but also that the permeability of these soils is likely to be low. A plan indicating the presence or absence of basements beneath the neighbouring properties with their extents and depths to demonstrate the existence of adequate flow paths for groundwater was requested following the initial audit. This has now been provided, although the depths are not indicated and it is stated the information is from publically available sources rather than site surveys.

1.8. It was requested that as built details of the existing foundations to No 12 be determined to enable the potential for differential settlement to be determined. This information was subsequently provided by email.

1.9. Category 0 to 1 damage is indicated for No 8 and 12 Clorane Gardens and whilst there are queries on the approach used in the assessment, it is accepted that damage may be limited to Category 1 assuming good control of workmanship and that the buildings are in sound condition.

1.10. Following the initial audit, there were queries on the trigger levels given in the movement monitoring proposals compared to the predicted levels. The response from Kyson states that the predicted levels may not be the limiting movements. This is accepted and final trugger levels may be agreed as part of the party wall award. Further information was provided by the applicant's geotechnical engineer demonstrating that assuming good control of workmanship, damage to neighbouring buildings should not exceed Burland Category 1.

1.11. The arboricultural assessment has demonstrated that damage to the retained trees should be avoided by the implementation of appropriate working practices.

1.12. It is accepted that the surrounding slopes to the development site are stable.

1.13. It is acknowledged that the proposed development will increase the impermeable area on the site and confirmation of the proposed method(s) of addressing this issue was requested. Surface quantities should be confirmed as part of detailed design together with the method proposed for the rain water harvesting required to account for the interception quantity in the calculations.

1.14. It is accepted that the development is not in an area subject to surface water of groundwater flooding flooding.

1.15. It is accepted that the BIA has identified the potential impacts of the proposed construction and proposes sufficient mitigation.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 25th January 2016 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 10 Clorane Gardens NW3 7PR (planning reference 2015/6734/P).

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

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

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment; and,

c) 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 via the process described by the GSD and to make recommendations for the detailed design.

2.4. LBC's Audit Instruction described the planning proposal as "*Excavation of basement and erection of rear ground floor extension*".

2.5. No 10 Clorane Gardens is not a listed building nor are there any adjoining listed buildings, however, it is situated within the Redington and Frognal Conservation area.

2.6. CampbellReith accessed LBC's Planning Portal on 1st March 2016 and gained access to the following relevant documents for audit purposes:

- Clorane Gardens_Planning Application form
- Cover Letter
- Development Description and Plans
- Structural calculations Clorane Gardens Jan 2016(2)
- BIA -GGC16494-RptR2- 10 Clorane Gardens - BIA (Complete)
- BIA - GGC16494 RptR1- 10 Clorane Gardens- Factual report on GI (Complete)
- Construction Management Plan (Redacted)
- Arboricultural Report
- Arboricultural TPP Layout1 (1)
- BIA -GGC 16494 - Electronic copy of services search (1)
- Sk1 Basement Rev B Jan 2016(2)
- Sk2 Ground floor Rev B Jan 2016(2)
- Sk3 Foundation Loading drawing Rev A Jan 2016(2)
- Sk4 Ground floor stage 1 enabling works Jan 2016(2)
- Sk5 Basement typical section Rev A(2)
- Sk6 steel stool installation sequence(2)
- Sk7 Basement column detail Rev A(2)
- Sk8 First Floor Jan 2016 Rev A(2)
- Sk9 Typical steel stool detail(2)
- Basement slab reinforcement summary X-X direction(2)
- Basement slab reinforcement summary Y-Y direction(2)
- GFS Reinforcement summary X-X direction(2)
- GFS Reinforcement summary Y-Y direction(2)
- Ground beam to rear extension reinforcement summary(2)
- Pad foundation reinforcement summary(2)
- Retaining wall section reinforcement summary(2)
- 12 Clorane Gardens 1 x Comment

- 12 Clorane Gardens letter re 10CG objections2 [54784]
- 12 Clorane Gardens letter to Camden 5 February
- 29 & 10 Briardale Gardens 2 x Comments
- 29 Briardale Gardens 1 x Comment
- 33 & 4 Briardale Gardens objections 4 x Comments
- 362 Finchley Road 1 x response
- Correspondence 10 Clorane Gardens- Camden 2015_6734_P
- Dr De Freitas report FINAL (V6) HEADED [54778]
- Dr de Freitas borehole logs sketch FIG 1 [54777]
- No 8 Clorane Gardens objection - Planning Appeal letter 15.02
- Eldred Geotechnics Technical Advice G1603-TA-01-E2
- Gabriel GeoConsulting response letter dated 4th March 2016.

2.7. Following the initial audit, supplementary information was received on 9 May and 6 June 2016 from the Planning Officer by email in response to the queries raised and the documents provided, some of which are included in Appendix 3, are as follows:

- Email response to initial audit queries from Kyson, dated 8 June 2016
- Amended proposed drawings
- Drawing indicating neighbouring property basements
- Reinforcement detail drawings
- Alan Baxter Partnership underpinning bay sequence
- Alan Baxter Partnership construction sequence drawings
- Alan Baxter Partnership structural calculations
- SenSe Associates SuDs calculations

2.8. Following receipt of the responses to the initial queries and supplementary documents, further queries on the monitoring proposal and SuDs calculation were raised and responses to these queries were received via email. Further justification of the building damage predictions was provided on 14 July 2016 (ref Appendix 3).

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	See Audit paragraph 4.1
Is data required by Cl.233 of the GSD presented?	Yes	Although a detailed works programme has not been provided, the anticipated durations of key elements of the works have been stated.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
Are suitable plan/maps included?	Yes	
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	BIA Section 7.3 and desk study data presented in Section 4.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.2 and desk study data presented in Section 6.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.4 and desk study data presented in Section 5.
Is a conceptual model presented?	Yes	BIA Section 10.1

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.3
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.2
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.4
Is factual ground investigation data provided?	Yes	Gabriel Geoconsulting Ltd Factual Report on Ground Investigation (Ref: 16494/R1) : BIA Appendix F.
Is monitoring data presented?	Yes	Two boreholes monitored but only on two occasions, 7 days apart.
Is the ground investigation informed by a desk study?	Yes	BIA appendices A – E.
Has a site walkover been undertaken?	Yes	21st October 2015.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Indicated on drawing provided with supplementary information however it is stated extent of basements shown are based on publically available information not site surveys.
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 survey and Adopted Services Search records.
Are the baseline conditions described, based on the GSD?	Yes	

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Yes. Informed by simplified analysis undertaken using PDISP software, CIRIA C580 approach and further justification (see Audit paragraph 4.14 and 4.15 and Appendix 3)
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Section 10.9
Has the need for monitoring during construction been considered?	Yes	BIA Section 10.7.
Have the residual (after mitigation) impacts been clearly identified?	N/A	None identified
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Assuming good workmanship
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Although drainage quantities to be confirmed in detailed design with proposals for rain water harvesting.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Although drainage quantities to be confirmed in detailed design with proposals for rain water harvesting.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Category 0 and 1 predicted for Nos 8 & 12 Clorane Gardens

Item	Yes/No/NA	Comment
Are non-technical summaries provided?	Yes	Within BIA

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) was undertaken by Gabriel Geoconsulting Limited and the individuals involved are a Chartered Geologist with an MSc degree in Engineering Geology and, a Chartered Civil Engineer and Chartered Water and Environmental Manager with an MSc degree in Soil Mechanics.

4.2. The Design & Access Statement identifies that the site is located within the Redington and Frognal Conservation area and sits just outside the Archeological Priority Area, however, no listed buildings are identified within the immediate vicinity of the site.

4.3. The proposal involves a single storey basement formed beneath the vast majority of the footprint of the existing house with external steps leading up into the garden behind the property. A new single-storey rear extension from the west corner of the building into part of the existing driveway and into the current location of the existing single-storey garage, which will be demolished, is also part of the proposals.

4.4. The formation of the basement requires excavations (including allowance for the basement structure and finishes) of between 2.80 and 3.80m. The variation largely reflects the south east to north west slope of the site with the greatest excavation depths generally occurring towards the Clorane Gardens road frontage.

4.5. The basement will extend down through the Made Ground, any remnant Head deposits and the underlying '*firm to stiff*', silty clays of the Claygate Member, and will be founded just below the top of the stiff, locally fissured, silty clays.

4.6. Groundwater monitoring was undertaken within both boreholes on two occasions (11th and 18th November 2015) and the maximum measured groundwater level was 1.69m below ground level. The response zones utilised within the borehole standpipes corresponded to the level of the basement slab and the soil zone below it (3.0m – 5.0m below existing ground levels), however, the BIA recognises that the Made Ground is likely to contain perched water and highlights that this needs to be addressed. Further groundwater monitoring was undertaken in April 2016 following 2016 following the initial audit and levels of 1.75 and 1.83m bgl was recorded in the two boreholes.

4.7. The BIA states that '*the proposed basement will not increase the width of the existing obstruction to seepage in the Made Ground around the existing foundations, while seepage through the laminae in the Claygate Member should generally be able to find an alternative route around the basement because there are no adjoining basements. The proposed basement is therefore considered acceptable in relation to groundwater flow.*' The likelihood of very low flow rates associated with the primarily clay soils present within the site appears to have been

validated by the ground investigation, however, notwithstanding this, the BIA identifies the possibility of undetected permeable soils being present and notes that 'in *the unlikely event……it is possible that an engineered groundwater bypass might be required*.' Prior to the commencement of construction of the new basement, the existence or otherwise of such undetected permeable soils should be established by further trial pitting or other suitable technique.

4.8. The BIA notes that the extent of the basement does not extend beyond the footprint of the existing building and that the existing building's foundations extend down through the full depth of the Made Ground and, thus, there will be no additional obstruction to the movement of perched groundwater within the Made Ground. The BIA states that the soils (Claygate Beds and London Clay) have been shown to have low permeability although there is some potential for seepage to occur through the laminae within these strata. The limited groundwater monitoring has shown that there is groundwater within the underlying soils and that it is under sub-artesian pressure (the monitoring zones within the installed standpipes were between 3.0m – 5.0m below ground level and the highest level recorded within the standpipes was 1.69m below ground level), however, the absence of water recorded during the drilling of the boreholes suggests that flow rates through the clay strata are low.

4.9. First Steps Ltd (consultation response 9th February 2016 on behalf of No 12 Clorane Gardens) suggests that the potential effects on the groundwater flows of the new basement in combination with the existing basements in the vicinity has not been appropriately assessed. The site investigation for No 10 has shown that the underlying soils are likely to be of low permeability and, therefore, groundwater flows will be slow and this appears to be supported by the differences in the water levels measured in the two boreholes. The presence of basements on the opposite side of Clorane Gardens is raised in the First Steps Ltd consultation response, however, the presence of an existing significant upstream obstruction to groundwater flows will tend to reduce the potential effects of the proposed No 10 basement. Reference was also made to the '*potential for creating an underground dam that extends from the boundary of No.16 to that of No.8*'. No 8 was understood to have a small boiler room below ground level with No 12 indicated to contain a basement separated from the proposed basement to No 10 by a small gap. The presence and extents of basements to Nos 14 and 16 was not confirmed. Following the initial audit, a plan confirming the absence of basements beneath No 8, 14 and 16 Clorane Gardens has been provided and is included in Appendix 3.

4.10. The BIA identified that the basement should be designed to resist the pressure from groundwater at ground level both in relation to lateral pressure on the basement walls and uplift on the basement slab because a permanent drainage system cannot be installed. This is because Thames Water will not allow long term discharge of groundwater into their sewers and there is no suitable water course available.

4.11. The site is approximately 370m to the west of the nearest of the former tributaries to the 'lost' River Westbourne, however, the Clorane Gardens area would have drained westwards to one of the other tributaries. These tributaries have been culverted or diverted into the sewer system so they are no longer able to receive surface water run-off and the, hence, the proposed development will not impact on the wider hydrogeology of the area or any watercourses or springs.

4.12. An arboricultural assessment has been undertaken and the findings are presented in the MWA Arboriculture Ltd report dated 17th September 2015. The report appraises the trees in relation to the proposed development of the site in accordance with British Standard 5837:2012 'Trees in relation to design, demolition and construction - Recommendations' and considers the existing trees on (and/or adjoining) the site and identifies the implications of the development on the retained trees. Few of the trees on the site are deemed to be significant although one large eucalyptus tree is to be removed together with two small, poor quality fruit trees. No incursions into the root protection areas of retained trees are required and it is stated that the retained trees can be successfully protected using barriers, details of which are provided. Details of appropriate working methods are provided to avoid damage to any exposed roots during the works.

4.13. The formation of the basement requires a combination of underpinning to the perimeter walls, new internal columns on isolated pad foundations and reinforced concrete walls formed in open excavations. The BIA identifies that temporary propping to the perimeter retaining walls (underpinning) is required until the construction work is complete and that face support to excavations will be required within the Made ground and Claygate Member, however, no proposals were included and it was stated that all temporary works designs are to be undertaken by the works contractor. Reinforcement details for the reinforced underpins are provided, however, no structural calculations were provided to justify this information or to demonstrate the stability of the underpins in the temporary condition. The BIA notes that the presence of laminae and associated groundwater seepages may require additional measures and recommends that the excavations are to be inspected by a competent person at the start of every shift and significant change in the geometry of the excavations. Calculations have now been provided together with drawings indicating the underpinning bay and construction sequence respectively.

4.14. First Steps Ltd requested that justification for the design of the basement is provided given the possibility of disturbed ground around No 12 due to the excavation of the basement for No 10. A Construction Management Plan that takes into account the variability of the ground revealed by the site investigation. The BIA includes a site investigation with investigation locations around the perimeter of No 10 including a borehole between No 10 & No 12 (borehole no 2) and the BIA recognises that temporary propping, local excavation face support and local

pumping of groundwater will be required. The works are also to be regularly inspected by a competent person as discussed above.

4.15. A damage assessment which appears to be based on some elements of the CIRIA C580 approach of predicting ground movements together with heave/settlements from Oasys Pdisp has been undertaken. The depth of excavation used to calculate ground movements due to excavation is the difference between the excavation depth and the neighbouring property foundation depths. Category 0 (Negligible) damage is predicted for No 8 with Category 1(Very Slight) damage predicted for No 12.

4.16. Whilst there are queries on the approach to the GMA, movements from underpinning is almost entirely due to workmanship. Damage to neighbouring properties may be limited to Category 1 provided the works are properly controlled and the buildings are in sound condition. Furthermore, the walls being underpinned do not form party walls as the property is detached. No 12 Clorane Gardens comprises a basement which further reduces the effects of the proposed basement construction on this property.

4.17. The Eldred Geotechnics Technical Advice note dated 26th February 2016 provided on behalf of No 12 Clorane Gardens queries the damage assessment to the southern wall of No 12 due to the presence of a partial basement to this elevation of that property. In their response to this report, Gabriel GeoConsulting highlight that usual good practice would suggest the underpinning is stepped beyond the extent of the basement. Were this stepped underpinning to be present, it would reduce the effects of the proposed construction of an adjoining basement and, hence, reduce the differential settlements experienced by No 12 and any consequential damage. It has subsequently been confirmed that no such stepping exists, however, a further ground movement/building damage assessment (see Appendix 3) confirmed that it should be possible to limit any damage to Burland Category 1 on the basis that workmanship is well controlled and the affected buildings are in sound condition.

4.18. Settlement monitoring proposals are set out in detail within the BIA, however, the trigger and action level settlements are higher than the predicted movements and in the event that the action level is reached there are no actions set out within the BIA other than to stop works whilst appropriate solutions are found. First Steps Ltd (consultation response 9th February 2016 on behalf of no 12 Clorane Gardens) requested that a monitoring protocol be provided. Whilst it is accepted that the final monitoring strategy may be agreed as part of the Party Wall award, it was requested that the monitoring strategy provided within the BIA be reviewed so that the potential for movements in excess of the predicted values is recognised before the predicted levels are exceeded and that action to rectify such exceedances is taken before it is necessary to halt the works. An email response (see Appendix 3) from Kyson advises that the predicted movements may not be the limiting movements for the predicted category of damage

and that is accepted. It is recommended that final trigger levels are agreed as part of the party wall award.

4.19. The BIA identifies that the both latest flood modelling by the Environment Agency and the Camden SFRA give a 'Very Low' risk of surface water flooding (the lowest category) for No.10's site and for all of the Clorane Gardens roadway and properties and consequently that only basic flood mitigation measures will be required. These include the incorporation of raised thresholds at external doors and non-return valves and/or pumped systems on the drains serving the basement, the lightwell/ lower terrace and all other areas which are connected via outfalls shared with the basement drainage.

4.20. The proposed rear lightwell, enlarged rear terrace, and the new kitchen extension will extend beyond the areas which are already fully paved or built over, although this will be partially offset if a permeable surfacing is used for the new pathway between the kitchen extension and the 10/12 boundary (as this path will replace part of No.10's garage). Thus, mitigation measures are identified as being required and a discussion of potentially suitable options is provided, however, the additional volumes of run off were not calculated and firm proposals to deal with them had not been made. SuDs calculations have now been provided which appear to slightly underestimate the surface water requiring disposal. These should be confirmed as part of detailed design together with the method proposed for the rain water harvesting required to account for the interception quantity in the calculations.

4.21. It is accepted that there are no slope stability concerns regarding the proposed development.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) was undertaken by Gabriel Geoconsulting Limited and the individuals concerned in its production have suitable qualifications.

5.2. The BIA has confirmed that the basement will extend down through the Made Ground, any remnant Head deposits and the underlying '*firm to stiff*', silty clays of the Claygate Member, and will be founded just below the top of the stiff, locally fissured, silty clays.

5.3. It is likely that both perched ground water and the groundwater table within the underlying clays will be encountered during basement foundation excavation. Thus, the basement is to be designed to accommodate groundwater at ground level and the construction of the basement will need appropriate temporary propping and face support to excavations, together with temporary drainage.

5.4. Calculations have now been provided together with drawings indicating the underpinning bay and construction sequence respectively as requested following the initial audit to demonstrate how the stability of the works is to be maintained and support is to be provided to the adjoining properties.

5.5. Groundwater monitoring results from two visits in November 2015 were presented within the BIA and additional monitoring was requested to establish the groundwater level. An additional groundwater monitoring visit has been undertaken and the results are included in the email response form Kyson included in Appendix 3.

5.6. Notwithstanding the ground investigation that has been undertaken, the potential for unidentified areas of higher permeability strata has been identified within the BIA and suitable further investigations need to be undertaken to confirm or disprove the presence of such strata prior to works commencing to enable the final details of the works to be confirmed.

5.7. The site investigation has shown that groundwater is present within the underlying silty clay soils but also that the permeability of these soils is likely to be low. A plan indicating the presence or absence of basements beneath the neighbouring properties with the extents and depths indicated where present to demonstrate the existence of adequate flow paths for groundwater was requested following the initial audit. This has now been provided, although the depths are not indicated and it is stated the information is from publically available sources rather than site surveys.

5.8. It was requested that as built details of the existing foundations to No 12 be determined to enable the potential for differential settlement to be determined. This information was provided

by email on 14 July 2016 together with further justification for the predicted building damage category of no greater than Burland Category 1.

5.9. Category 0 to 1 damage is indicated for No 8 and 12 Clorane Gardens and whilst there are queries on the approach used in the assessment, it is accepted that damage may be limited to Category 1 assuming good control of workmanship and that the buildings are in sound condition.

5.10. Following the initial audit, there were queries on the trigger levels given in the movement monitoring proposals compared to the predicted levels. The response from Kyson states that the predicted levels may not be the limiting movements and this was accepted, although the finally adopted trigger levels should be agreed as part of the party wall award.

5.11. The arboricultural assessment has demonstrated that damage to the retained trees should be avoided by the implementation of appropriate working practices.

5.12. It is accepted that the surrounding slopes to the development site are stable.

5.13. It is acknowledged that the proposed development will increase the impermeable area on the site and confirmation of the proposed method(s) of addressing this issue was requested. Surface water quantities should be confirmed as part of detailed design together with the method proposed for the rain water harvesting required to account for the interception quantity in the calculations.

5.14. It is accepted that the development is not in an area subject to surface water of groundwater flooding flooding.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Marsh and Field	12 Clorane Gdns NW3 7PR	16/02/2016	Dr DeFreitas Groundwater Assessment report. Eldred Geotechnics technical assessment. Loss of amenity due to proposed tree removal. Proposed kitchen glass dome and rear balcony.	Refer to section 4 Refer to section 4 Not applicable to the BIA Not applicable to the BIA
Davis	29 Briardale Gardens Hampstead	22/01/2016	In particular the felling of 3 trees is unnecessary. The BIA is inadequate and does not give neighbours a true picture of damage to their homes. There is no construction management plan. This is overdevelopment of the host building and will be a negative contribution to the conservation area.	Not applicable to the BIA Damage assessments have been undertaken for appropriate adjoining properties. Other properties are outside zone of influence of basement construction. Plan provided but requires contractor input to complete. Not applicable to the BIA
Lee	10 Briardale Gardens NW3 7PP	22/01/2016	Construction traffic impacts.	Not applicable to the BIA
Davis	29 Briardale Gardens Hampstead	14/02/2016	Adequacy of the duration of groundwater monitoring. Potential for ground instability.	Further monitoring undertaken as requested (see Audit paragraph 4.6). Site specific ground investigation undertaken

				and basement to be founded in natural strata. Slope of site moderate and properties are not known to exhibit settlement damage.
			Proximity of water features.	Minor ponds located uphill of the application site at significant distance.
			Adequacy of neighbour consultations and suitability of damage assessments.	Damage assessments have been undertaken for appropriate adjoining properties. Other properties are outside zone of influence of basement construction.
			Traffic impacts and potential noisy works.	Not applicable to the BIA
			Alterations to a Quennell House.	Not applicable to the BIA
			Absence of significant environmental improvements to building fabric.	Not applicable to the BIA
			Felling of 3 trees with loss of amenity and potential groundwater impacts.	Not applicable to the BIA
			Potential groundwater impacts due to combined effect of further basement with existing basements.	Plan showing basements to adjoining properties to demonstrate adequate groundwater flow paths provided as requested (see Audit paragraph 4.9).
			Potential construction traffic impacts.	Not applicable to the BIA
			Noise and dust impacts.	Not applicable to the BIA
			Shared right of access infringement.	Not applicable to the BIA
Sochor	33 Briardale Gardens	17/02/2016	Alterations to a Quennell House.	Not applicable to the BIA
			Overdevelopment of the plot.	Not applicable to the BIA
			Victorian brickfield in vicinity of property.	Site specific ground investigation undertaken

			Potential construction traffic impacts.	Not applicable to the BIA
Samuel	5 Briardale Gardens London	17/02/2016	Have impacts on adjoining properties been adequately assessed? Construction traffic impacts.	See BIA audit paragraph 4.15 and 4.16 Not applicable to the BIA
Steinberg	362 Finchley Road ground floor NW3 7AJ	07/02/2016	Inadequate demonstration of the impacts on the neighbourhood. Potential impacts of basements on the ground water in the area.	Not applicable to the BIA Plan showing basements to adjoining properties to demonstrate adequate groundwater flow paths provided as requested (see Audit paragraph 4.9).
Ross	8 Clorane Gardens NW3 7PR	17/02/2016	Potential groundwater impacts due to combined effect of further basement with existing basements. Additional borehole monitoring for groundwater. Potential construction traffic impacts. Noise and dust impacts. Loss of amenity value of trees.	Plan showing basements to adjoining properties to demonstrate adequate groundwater flow paths provided as requested (see Audit paragraph 4.9). Further monitoring undertaken as requested (see Audit paragraph 4.6). Not applicable to the BIA Not applicable to the BIA Not applicable to the BIA

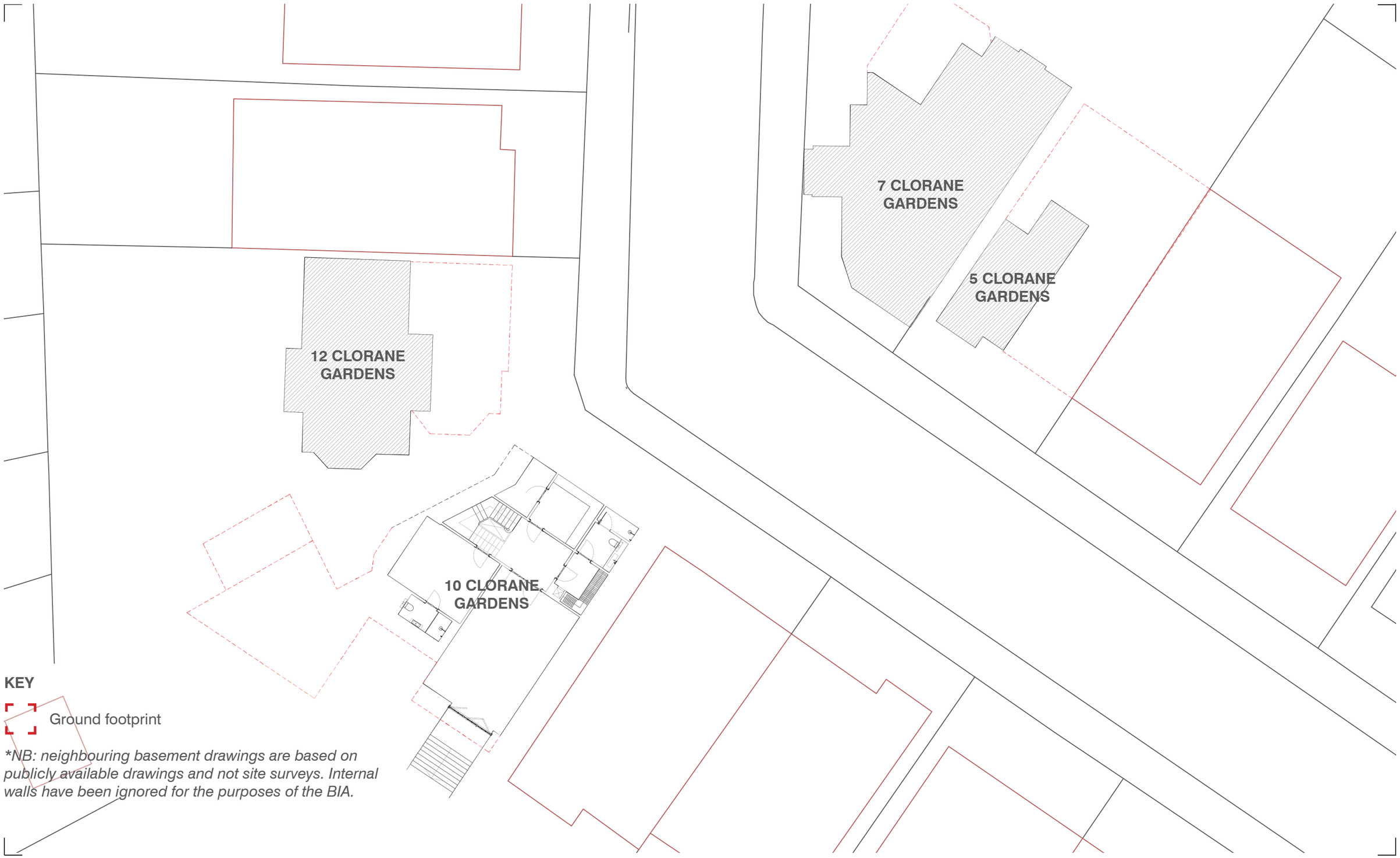
Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Details of design of underpinning and cantilever retaining walls in the temporary condition together with associated temporary propping requirements.	Closed – Provided with supplementary information	05/07/16
2	Stability	As-built details of existing foundations to south wall of No 12 to be determined to enable the potential for differential settlement to be established.	Closed – Information provided.	14/07/2016
3	Stability	Confirmation of the proposed foundation solution for the kitchen required.	Closed – Provided with supplementary information	05/07/16
4	Stability	Refinement of the movement monitoring proposals required.	Closed – Details and trigger levels to be agreed as part of Party Wall award.	N/A
5	Drainage	Confirmation of the volume of additional surface water run off and the proposed means of attenuating and discharging it.	Open – Calculations provided	05/07/16
6	Hydrogeology	Further groundwater monitoring to supplement 2 sampling visits undertaken in November 2015.	Closed – Undertaken as requested.	05/07/16
7	Hydrogeology	Plan showing basements to adjoining properties to demonstrate adequate groundwater flow paths	Closed – Provided with supplementary information	05/07/16

Appendix 3: Supplementary Supporting Documents

APPENDIX C
NEIGHBOURING BASEMENTS

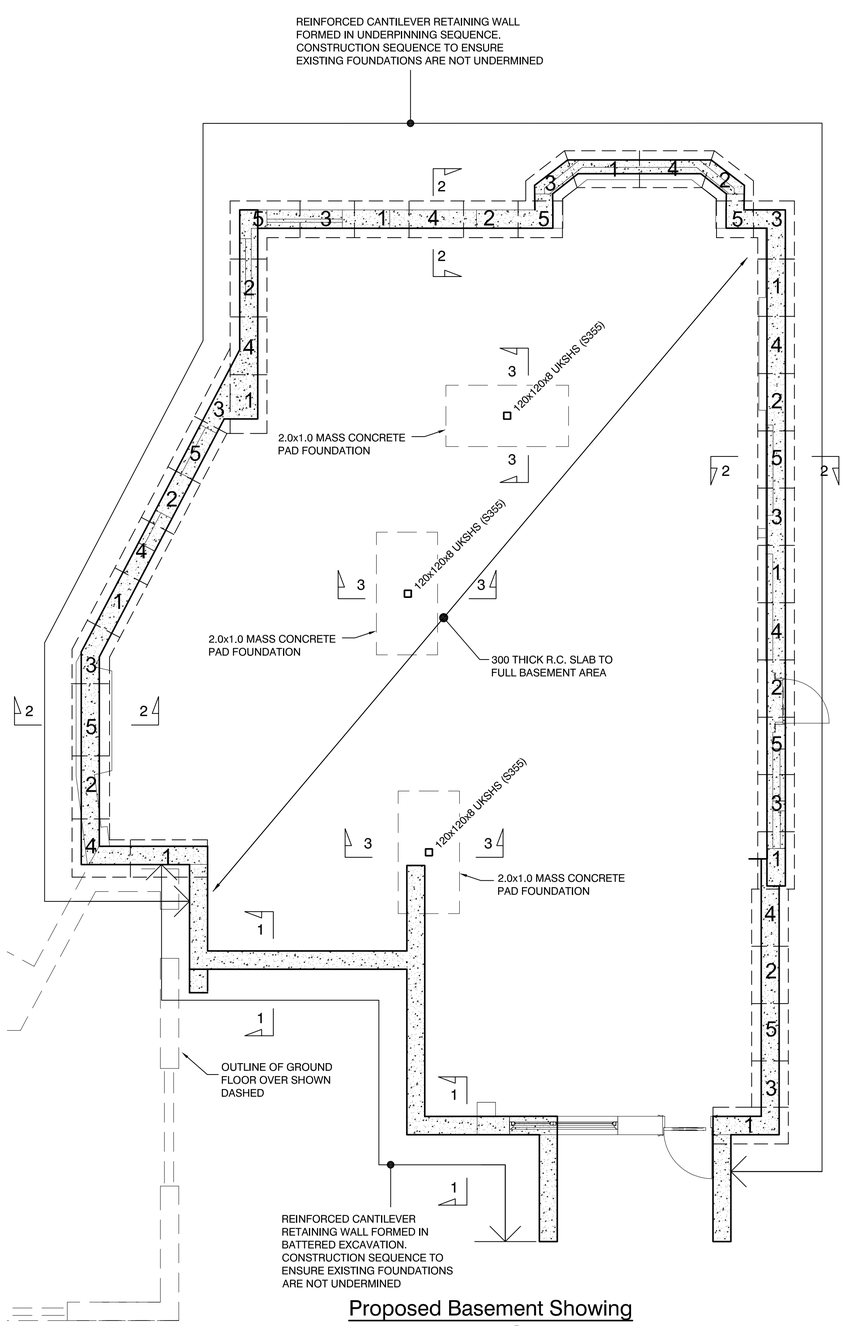


KEY

Ground footprint

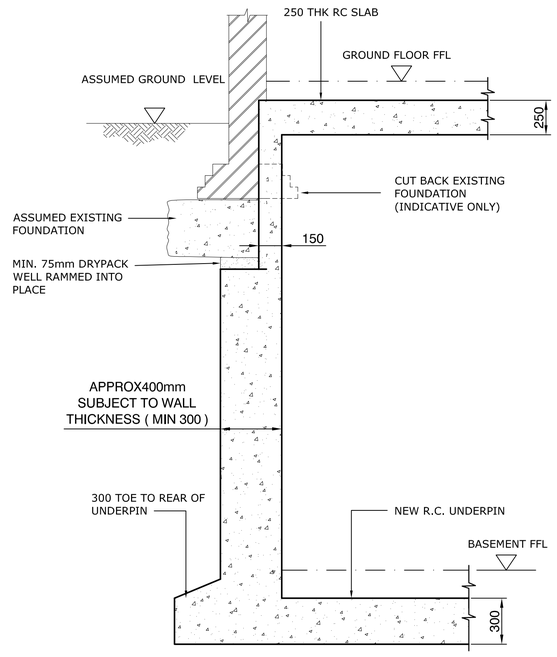
**NB: neighbouring basement drawings are based on publicly available drawings and not site surveys. Internal walls have been ignored for the purposes of the BIA.*

BASEMENT PLANs. DRAWING no. 4000. 1:200@A3



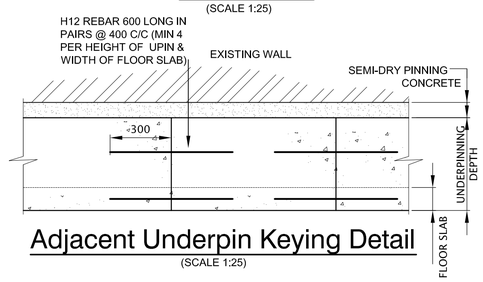
Proposed Basement Showing Underpinning Sequence

(Scale 1:50 @ A1)



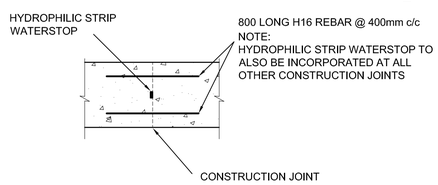
Section 2-2

(SCALE 1:25)



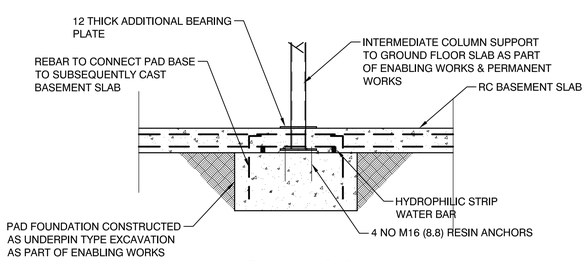
Adjacent Underpin Keying Detail

(SCALE 1:25)



Typical Construction Joint Detail Between Sequenced Retaining Wall Sections

(SCALE 1:25)



Section 3-3

(Scale 1:25)

NOTE FOR FORMING R.C.RETAINING WALL UNDERPINS

1. FORM RETAINING WALL IN SECTIONS, APPROX. 1.0m WIDTHS IN SEQUENCE AS SHOWN ON PLAN .

2. EACH LEG IS TO BE EXCAVATED, CONCRETED AND PINNED TIGHT TO EXISTING FOOTING BEFORE STARTING NEXT LEG.

3. EACH LEG IS DESIGNED AS A CANTILEVER AND THEREFORE THE ASSOCIATED SLAB SECTION MUST BE CAST WITH THE WALL SECTION.

4. LAST 50mm OF EXCAVATION NOT TO BE CARRIED OUT UNTIL CONCRETE IS READY TO BE POURED.

5. BOTTOM OF EACH EXCAVATION TO BE APPROVED BY BUILDING CONTROL OR AN APPROVED INSPECTOR OR THE ENGINEER PRIOR TO CONCRETING

6. UNDERSIDE OF EXISTING FOUNDATION TO BE THOROUGHLY CLEANED PRIOR TO POURING OF RETAINING WALL SECTION.

7. CONCRETE TO BE PLACED WITHIN 75mm OF EXISTING FOOTING.

8. AT LEAST 24 HOURS AFTER CONCRETE POUR, SEMI DRY PINNING CONCRETE TO BE RAMMED IN HARD.

9. CUBE TESTS OF THE INSITU CONCRETE ARE REQUIRED AND THE CONTRACTOR IS NOT TO STRIKE (OR REMOVE ANY PROPPING) PRIOR TO CONFIRMING THAT THE CONCRETE STRENGTH IS A MINIMUM OF 75% OF SPECIFIED STRENGTH (NORMALLY ACHIEVED AT 7 DAYS)

10. AT LEAST 24 HOURS TO LAPSE BEFORE EXCAVATING NEXT LEGS IN SEQUENCE. (WHILST ENSURING ITEM 7 ABOVE IS COMPLIED WITH)

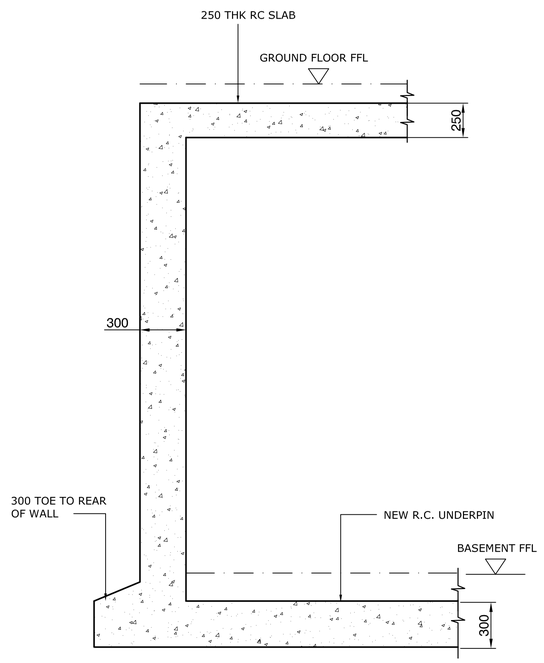
11. SIDES OF PREVIOUSLY POURED UNDERPINNING LEGS TO BE THOROUGHLY CLEANED BEFORE POURING ADJOINING LEG & HORIZONTAL REINFORCEMENT LAP PROVIDED

12. DURING CONSTRUCTION OF UNDERPINS, THERE IS TO BE NO CONTINUOUS EXCAVATIONS PARALLEL TO THE WALL BEING UNDERPINNED OF A DEPTH GREATER THAN 100mm ABOVE THE WALLS EXISTING FORMATION LEVEL.

13. ENGINEER TO BE IMMEDIATELY NOTIFIED OF ANY VARIATION TO ASSUMED STRUCTURAL WORKS.

14. THE CONTRACTOR IS TO ENSURE ALL PROPPING IS PROVIDED AND MAINTAINED DURING UNDERPINNING OPERATIONS.

15. CONCRETE TO UNDERPINING LEGS TO BE RC35 GRADE WITH 20mm AGGREGATE



Section 1-1

(SCALE 1:20)

NOTES

1. DO NOT SCALE OFF THIS DRAWING
2. TO BE READ IN CONJUNCTION WITH ALL ARCHITECT'S AND ENGINEER'S DRAWINGS
3. ALL SETTING OUT DIMENSIONS AND LEVELS TO BE CONFIRMED PRIOR TO COMMENCEMENT OF WORKS

Rev	Description	Drn	Chk	Date
B	UPDATED TO NEW LAYOUT	AG	GS	07-06-16
A	SECTIONS ADDED AND PLAN& NOTE REV'D	MA	GS	31-05-16

ALAN BAXTER PARTNERSHIP LLP
CONSULTING STRUCTURAL ENGINEERS
THE CLOCK BUILDING
PYMPES COURT
BUSBRIDGE ROAD
LOOSE
MAIDSTONE
KENT ME15 0HZ
TELEPHONE: 01622 744263
FAX: 01622 749270
EMAIL: mail@abpengineers.co.uk

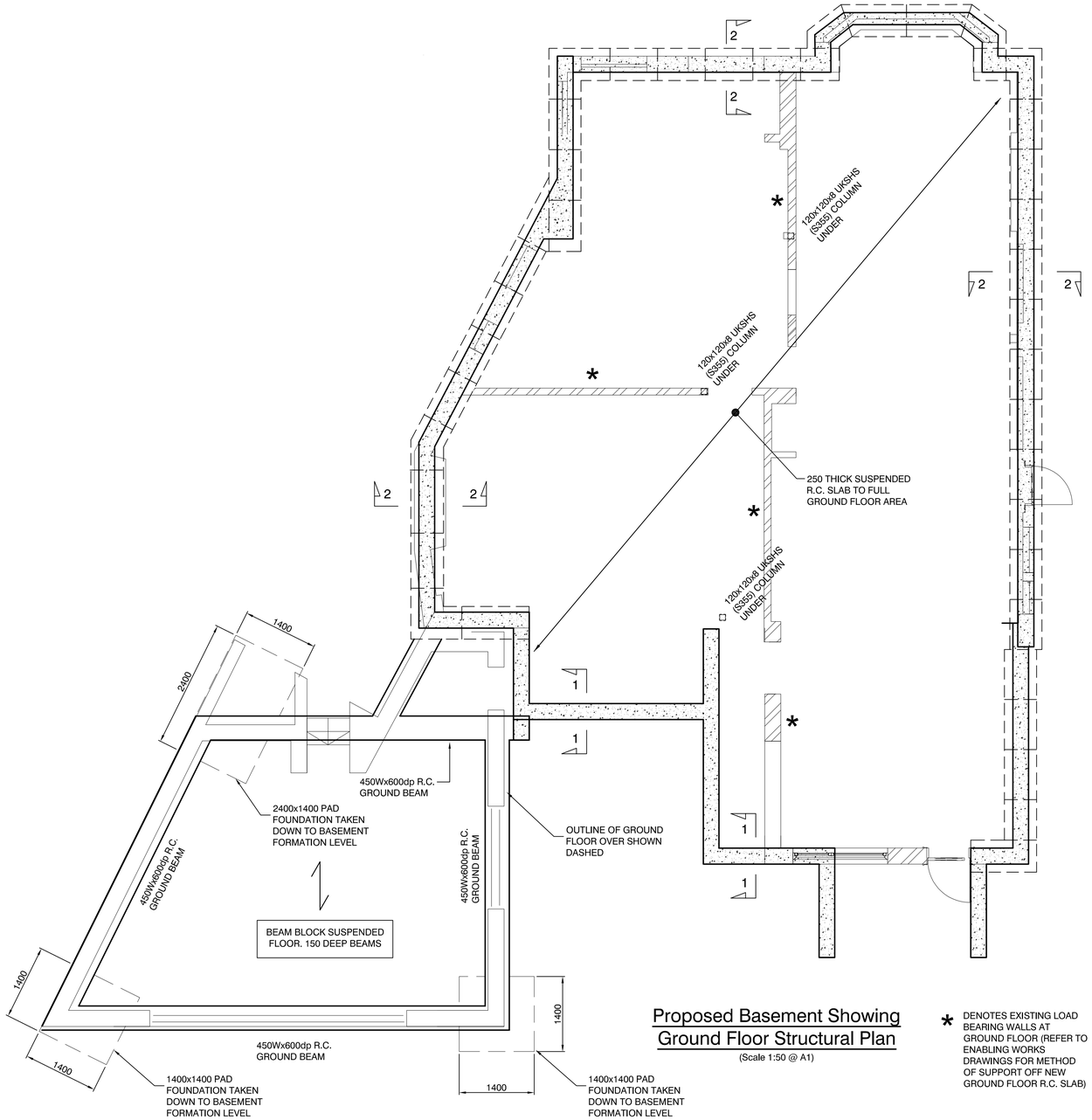
Project

10 Clorane Gardens
London
NW3

Drawing

Basement Showing Underpinning Sequence and Details

Date	Jan. '16	Scale	1:50 / 1:20 @ A1
Ref	K697-A1-01	Rev	B



Proposed Basement Showing Ground Floor Structural Plan

(Scale 1:50 @ A1)

* DENOTES EXISTING LOAD BEARING WALLS AT GROUND FLOOR (REFER TO ENABLING WORKS DRAWINGS FOR METHOD OF SUPPORT OFF NEW GROUND FLOOR R.C. SLAB)

0 1 2 3 4 5m 10m
scale 1:50

0 1 2 3 4 6 8 10m
scale 1:100

NOTES

1. DO NOT SCALE OFF THIS DRAWING
2. TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS AND ENGINEERS DRAWINGS
3. ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY THE ARCHITECT AND CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.
4. ALL DISCREPANCIES TO BE NOTIFIED IMMEDIATELY TO CONTRACT ADMINISTRATOR AND ENGINEERS.
5. TENDER OR BILLING DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR THE ORDERING OF MATERIALS.

PRELIMINARY

Rev	Description	Drn	Chk	Date
A	UPDATED TO NEW LAYOUT	AG	GKS	07.06.16

ALAN BAXTER PARTNERSHIP LLP
CONSULTING STRUCTURAL ENGINEERS
THE CLOCK BUILDING
PYMPES COURT
BUSBRIDGE ROAD
LOOSE
MAIDSTONE
KENT ME15 0HZ
TELEPHONE: 01622 744263
FAX: 01622 749270
EMAIL: mail@abpengineers.co.uk

Project

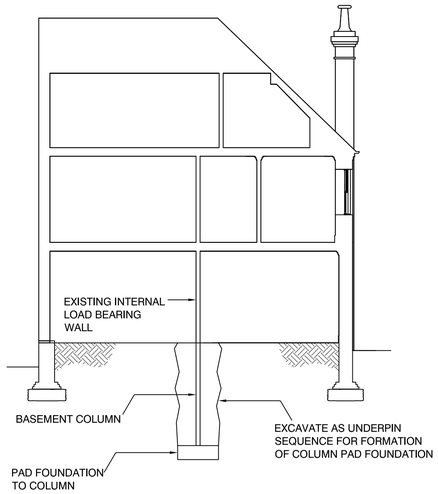
10 Clorane Gardens
London
NW2

Drawing

Ground Floor GA

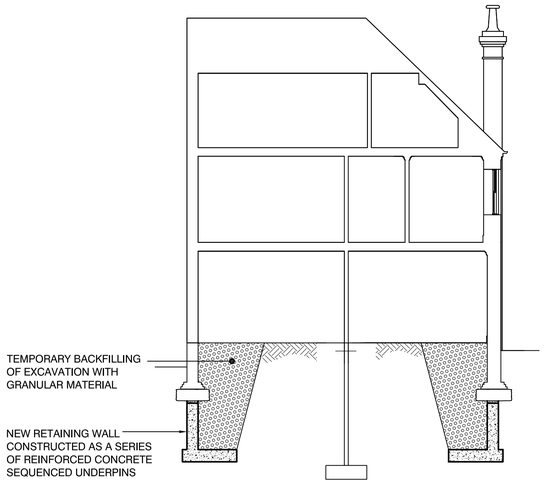
Date Jan. '16 | Scale 1:50 / 1:20 @ A1

Ref K697-A1-02 | Rev A



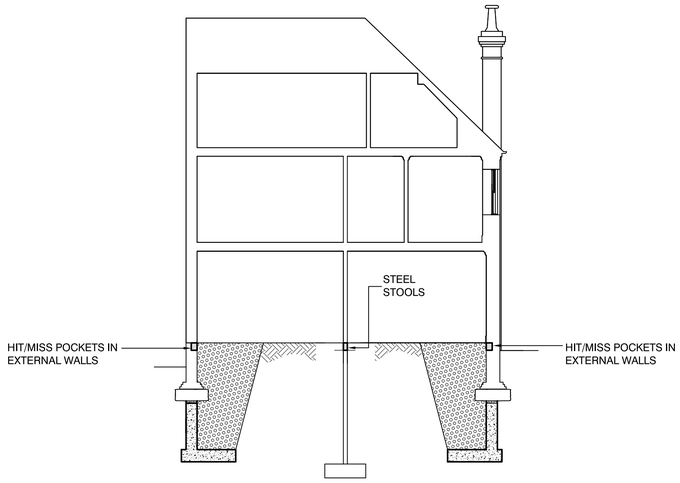
STAGE 1:

1. INSTALL TEMPORARY/PERMANENT INTERMEDIATE SUPPORT COLUMN WITHIN BASEMENT



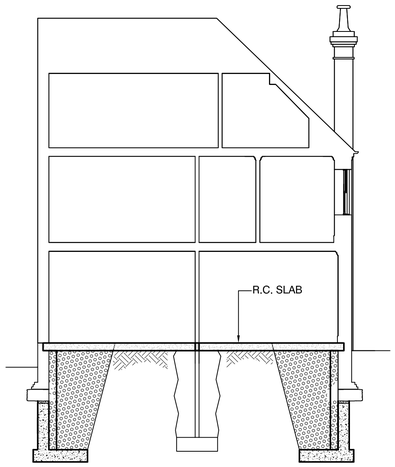
STAGE 2:

1. FORM BASEMENT WALLS UNDER EXISTING PERIMETER WALLS IN UNDERPINNING SEQUENCE. EXCAVATIONS TO BE TEMPORARILY BACKFILLED TO ALLOW CONSTRUCTION OF REINFORCED CONCRETE GROUND FLOOR SLAB.
2. FORM BASEMENT WALLS OUTSIDE OF BUILDING FOOTPRINT AS REINFORCED CONCRETE RETAINING WALLS, EXCAVATIONS TO BE BATTERED BACK



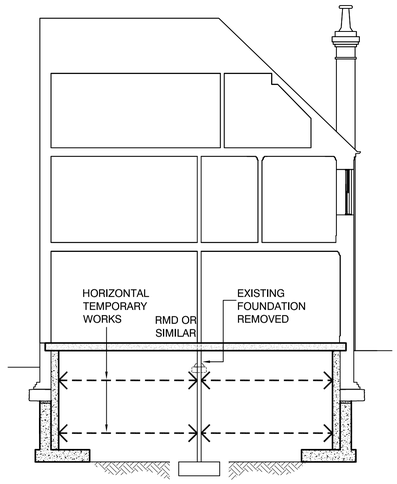
STAGE 3:

1. CREATE CONTINUOUS SLOT AT BASE OF LOAD BEARING WALLS BY INSTALLING STEEL STOOLS AT REGULAR CENTRES IN AN UNDERPINNING TYPE SEQUENCE
2. CUT HIT/MISS POCKETS IN EXTERNAL WALLS FOR SUPPORT OF NEW REINFORCED CONCRETE GROUND FLOOR SLAB



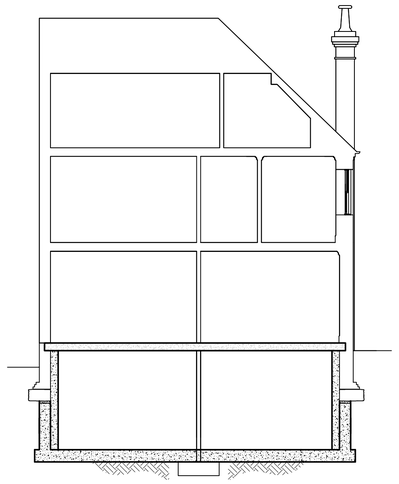
STAGE 4:

1. REMOVE EXISTING GROUND FLOOR AND REDUCE/LEVEL OUT GROUND TO FORMATION LEVEL OF NEW GROUND FLOOR SLAB
2. CAST R.C. GROUND FLOOR SLAB



STAGE 5:

1. EXCAVATE BELOW NEW GROUND FLOOR SLAB IN A TOP DOWN MANNER FROM A TEMPORARY 'MOLE HOLE' IN THE FRONT, OR THE PROPOSED STEPS ACCESS AT THE REAR
2. AS EXCAVATION PROCEEDS, INSTALL HORIZONTAL TEMPORARY WORKS AS REQUIRED



STAGE 6:

1. CAST REINFORCED CONCRETE BASEMENT SLAB AS INTEGRAL WITH THE 'UNDERPINNING' PERIMETER RETAINING WALLS.
2. REMOVE TEMPORARY HORIZONTAL PROPPING.
3. INSTALL PERMANENT WORKS COLUMNS TO PROVIDE INTERMEDIATE INTERNAL SUPPORTS TO GROUND FLOOR SLAB/INTERNAL LOAD BEARING WALLS
4. CUT DOWN AND REMOVE TEMPORARY PILES

NOTES

1. DO NOT SCALE OFF THIS DRAWING
2. TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS AND ENGINEERS DRAWINGS
3. ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY THE ARCHITECT AND CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.
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5. TENDER OR BILLING DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR THE ORDERING OF MATERIALS.

CONSTRUCTION

Rev	Description	Drn	Chk	Date

ALAN BAXTER PARTNERSHIP LLP
CONSULTING STRUCTURAL ENGINEERS
THE CLOCK BUILDING
PYMPES COURT
BUSBRIDGE ROAD
LOOSE
MAIDSTONE
KENT ME15 0HZ
TELEPHONE: 01622 744263
FAX: 01622 749270
EMAIL: mail@abpengineers.co.uk

Project

10 Clorane Gradens
London
NW3

Drawing

Construction Sequence Drawing

Date Nov. '15 | Scale 1:100 @ A1

Ref K697-A1-CS01 | Rev

SEnSe Associates LLP
Land Remediation Consultants

10 Clorane Gardens NW3 7PR – Sustainable Drainage Concept/Options/Calculations

Basic drainage areas – There is an approximate area of 97 sqm of 'new' hard surfacing to the rear of the property in the proposed design; comprising a rear patio, kitchen roof, balcony and steps down to basement playroom. The main property roof and driveway remain unaltered in outline, and all these 'hard' areas are already draining to the public sewer serving the property. Currently, a garage roof (20sqm) also drains by downpipe to the gulley in the driveway (combining with adjacent garage roof), and hence to public sewer; that garage is to be demolished. The existing (35 sqm) & proposed patios (26sqm) both discharge onto the rear garden directly. The steps down to playroom (11 sqm) will need to drain into the mains sewer system of the property. The kitchen roof and balcony (60 sqm) do not necessarily need to drain to the sewer system, although that option is to remain.

Baseline – Need to provide greenfield run-off from site as flow equivalent (as per LBCamden spec). The whole site is approximately 510sqm (0.05ha), of which just less than half (ca. 240sqm) is currently laid to lawn; the new layout does not reduce the lawn area by a large amount, only by about 10-15%. Thus at least 200sqm (40%) remains 'greenfield'. The run-off rate for 0.02ha of greenfield (HR Wallingford sheet 1) would be 0.09 lit/sec, albeit this calculation has to be 'artificially' corrected for the minimum applicable site area of 0.1ha.

Design Assumptions – The figure of 97sqm above translates to approx. **42sqm** of additional hard (impermeable) ground, removing the garage (20sqm) and existing rear patio areas (35sqm). As noted earlier, only the steps to the playroom (11sqm) need to drain to main sewer, so there is a potential **9sqm reduction** in the area draining to main sewer (by dint of removing the 20sqm garage roof area from the situation), but only **IF** the kitchen roof & balcony area discharges to soakaway or intervention storage in the rear garden. Assuming it does **not**, and the sewer that currently exists is to be 'added to', a 'throttle' on additional runoff relating to 42sqm (0.004ha) of greenfield is needed; using HRW's computational default, this should be at 2 lit/sec/ha (= 0.008 lit/s here); we should assume a Zero outflow for the sake of a simplistic calculation of rainfall that would need to 'pond' on the roof.

SuDS Calculation for the additional hard cover (42sqm) – see attached HRW extract (sheet 2), which can only be computed for a minimum area draining to SUDs **of 0.1ha**. This uses a 10 year return period chosen for 'rainwater harvesting' and 100% compliance factor; it also uses a Soil Type of Class 4 (heavy clay), as found on site. A climate change Factor of 1.3 is applied, alongside 'Urban Creep' factor of 1.1. The 'Estimated Storage Volume' by HRW calculation would be 3.96 cum for 0.1ha impermeable area; proportional reducing this by 1/24th for 42sqm (0.004ha) would give an interception storage volume requirement of 3.96/24 = **0.16cum (165 lit)** with a specified greenfield run-off rate of 5 lit/sec (which is the minimum applied by HRW) and an attenuation storage volume of 16.8/24 = **0.7 cum (700 lit)**. This is the storage required on the new kitchen roof, with a flow control on any downpipe leading to the mains sewer; it computes to 16mm average depth (*which is a similar figure to a 15mm storm rainfall used in domestic soakaway design by the Building Research Establishment, BRE Digest 151 calculations, albeit this pre-dates 'climate change' considerations*).

SEnSe Associates LLP
Land Remediation Consultants

Calculation for no addition to sewer capacity -Taking the flow control element out of the calculation completely (again using the 0.1ha minimum area applied by HRW, adjusted for this site), and assuming long-term storage of 'relevant' rainfall on the first floor roof areas, the calculation (sheet 3) for the site would give a Total Storage of 11.75 cum, which would proportion down at 1/24th to **0.49cum (490 lit).** This is the minimum 'free' storage required in either a ground soakaway arrangement (i.e. above the inlet pipe invert level) or in interception storage tanks (eg. water butts, for grey water re-use on the garden or house), should there be no kitchen roof downpipe leading to a sewer connection.

In formally calculating soakaway or storage tank size in the rear garden, the actual area draining to the unit needs to compute as at least 60sqm (the kitchen roof & balcony, excluding any formal capture of patio or side path run-off), for the design of total capacity. In simplistic terms, using the BRE151 design rainfall of 15mm and no immediate soakage, this would require **0.9cum** of 'free' capacity. A more cautious design approach, using 25mm (one inch) rainfall, would require capacity of **1.5cum** to be designed into the arrangement.

RECOMMENDATION – Design using a 500 litre storage capacity rainwater harvesting tank or a larger (0.9cum), shallow soakaway at the rear of the property; near-surface soils should have suitable soakage capability, but siting of the soakaway in relation to the basement and adjacent properties would need to be considered carefully. **OR** allow for temporary storage/ponding of up to 25mm depth (at lowest/discharge point) on the kitchen roof with an attenuated 'slow' discharge to sewer by downpipe at the front of the property (pending on formal computation, suitable flow restriction device, and agreement by Thames Water).

Above-ground storage tanks at the rear would need to have an overflow facility to cope with extreme rainfall events and also must have 'available' capacity in the event of a rainstorm, i.e. they are not kept full after previous rainfall. In practical terms, twin 500 litre water butts with one kept empty would be the simplest arrangement to facilitate.

Calculations by I.M.Summersgill, C.Eng, C.WEM – dated 22nd May 2016 (rev.1).

SEnSe Associates LLP
Grafton House
East Street
HUNTON
Kent ME15 0RA
Tel: 01622-820429; 07779-367412
Email: senseass@btinternet.com

HRW Sheet 1

HR Wallingford
Working with water

Greenfield runoff estimation for sites

Site name: 10 Clorane Gdns

Site location: LONDON NW3

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site coordinates

Latitude: 51.55947° N

Longitude: 0.19558° W

Reference: gcpv7d1edtuf / 0.1

Date: 23 May 2016

Site characteristics

Total site area	0.1	ha
Significant public open space	0.08	ha
Area positively drained	0.02	ha

Methodology

Greenfield runoff method	IH124

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	4
HOST class	N/A
SPR	0.47

Hydrological characteristics

	Default	Edited	
SAAR	660	660	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.76	0.76	
Hydrological region	6	6	
Growth curve factor: 1 year	0.85	0.85	
Growth curve factor: 10 year	1.62	1.62	
Growth curve factor: 30 year	2.3	2.3	
Growth curve factor: 100 year	3.19	3.19	

Greenfield runoff rates

	Default	Edited	
Qbar	0.09	0.09	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.00	5.00	l/s
1 in 100 years	5.00	5.00	l/s

Please note that a minimum flow of 5 l/s applies to any site

HRW Sheet 2

HR Wallingford
Working with water

Surface water storage requirements for sites

Site name: 10 Clorane Gdns

Site location: London nw3

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site coordinates

Latitude: 51.55947° N

Longitude: 0.19563° W

Reference: gcpv7d1e9mzd / 0.05

Date: 16 May 2016

Site characteristics

Total site area	0.1	ha
Significant public open space	0	ha
Area positively drained	0.1	ha
Impermeable area	0.1	ha
Percentage of drained area that is impermeable	100	%
Impervious area drained via infiltration	0	ha
Return period for infiltration system design	10	year
Impervious area drained to rainwater harvesting systems	0.1	ha
Return period for rainwater harvesting system design	10	year
Compliance factor for rainwater harvesting system design	100	%
Net site area for storage volume design	0.05	ha

Methodology

Greenfield runoff method	IH124
Volume control approach	Flow control to max of 2 l/s/ha or *

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	4
HOST class	N/A
SPR	0.47

Hydrological characteristics

	Default	Edited	
SAAR	660	660	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.76	0.76	
Hydrological region	6	6	
Growth curve factor: 1 year	0.85	0.85	
Growth curve factor: 10 year	1.62	1.62	
Growth curve factor: 30 year	2.3	2.3	
Growth curve factor: 100 year	3.19	3.19	

Design criteria

Climate change allowance factor	1.3	
Urban creep allowance factor	1.1	
Interception rainfall depth	5	mm

Greenfield runoff rates

	Default	Edited	
Qbar	0.45	0.45	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.00	5.00	l/s
1 in 100 years	5.00	5.00	l/s

Please note that a minimum flow of 5 l/s applies to any site

Estimated storage volumes

	Default	Edited	
Interception storage * →	3.96	3.96	m^3
Attenuation storage * →	16.80	16.80	m^3
Long term storage	0.00	0.00	m^3
Treatment storage	5.91	5.91	m^3
Total storage	20.76	20.76	m^3

HRW Sheet 3

HR Wallingford
Working with water

Surface water storage requirements for sites

Site name: 10 Clorane Gdns

Site location: London nw3

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site coordinates

Latitude: 51.55947° N

Longitude: 0.19563° W

Reference: gcpv7d1e9mzd / 0.02

Date: 16 May 2016

Site characteristics

Total site area	0.1	ha
Significant public open space	0.07	ha
Area positively drained	0.03	ha
Impermeable area	0.02	ha
Percentage of drained area that is impermeable	74.07	%
Impervious area drained via infiltration	0	ha
Return period for infiltration system design	10	year
Impervious area drained to rainwater harvesting systems	0.01	ha
Return period for rainwater harvesting system design	10	year
Compliance factor for rainwater harvesting system design	100	%
Net site area for storage volume design	0.02	ha

Methodology

Greenfield runoff method	IH124
Volume control approach	Use Long Term Storage

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	4
HOST class	N/A
SPR	0.47

Hydrological characteristics

	Default	Edited	
SAAR	660	660	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.76	0.76	
Hydrological region	6	6	
Growth curve factor: 1 year	0.85	0.85	
Growth curve factor: 10 year	1.62	1.62	
Growth curve factor: 30 year	2.3	2.3	
Growth curve factor: 100 year	3.19	3.19	

Design criteria

Climate change allowance factor	1.4	
Urban creep allowance factor	1.1	
Interception rainfall depth	5	mm

Greenfield runoff rates

	Default	Edited	
Qbar	0.12	0.12	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.00	5.00	l/s
1 in 100 years	5.00	5.00	l/s

Please note that a minimum flow of 5 l/s applies to any site

Estimated storage volumes

	Default	Edited	
Interception storage	0.80	0.80	m^3
Attenuation storage	8.88	8.88	m^3
Long term storage	2.08	2.08	m^3
Treatment storage	1.95	1.95	m^3
Total storage	11.75	11.75	m^3

Dear Liz,

Please find attached additional information for 10 Clorane Gardens (2015/6734/P).

Kind regards,

Tessa Craig
Planning Officer

Telephone: 020 7974 6750

From: Stuart Eaves [mailto:Stuart.eaves@kyson.co.uk]
Sent: 08 June 2016 12:05
To: Craig, Tessa
Subject: Clorane Gardens

Dear Tessa,

Please see attached information in response to Campbell Reith and the query's listed in appendix2 'Audit Query Tracker' below:

1	Details of design of underpinning and cantilever retaining walls in the temporary condition together with associated temporary propping requirements	ABP Drawings: - K697-A1-01 RevB - K697-A1-02 RevA - K697-A1-CS01 - Basement Slab Reinforcement Summary X-X direction - Basement Slab Reinforcement Summary Y-Y direction

<table>
<tr><td></td><td></td><td>- GFS Reinforcement summary X-X direction
- GFS Reinforcement summary Y-Y direction
- Ground beam to rear extension reinforcement summary
- Pad foundation reinforcement summary
- Retaining wall section reinforcement summary
- SK4 Ground floor stage 1 enabling works 2016
- SK5 Basement Typical Section RevA
- SK6 Steel stool installation sequence
- SK7 Basement Column detail RevA</td></tr>
<tr><td>2</td><td>As-built details of existing foundations to south wall of no 12 to be determined to enable the potential for differential settlement to be established</td><td>Contact attempt multiple times, unable to gain response.</td></tr>
<tr><td>3</td><td>Confirmation of the proposed foundation solution for the kitchen required.</td><td>ABP:
See above drawings.</td></tr>
<tr><td>4</td><td>Refinement of the movement monitoring proposals required.</td><td>Response from GabrielGeo Consulting: Paragraph 4.16 of the audit report sets out the detailed concerns that “the trigger and action level settlements are higher than the predicted movements…”. This appears to confuse movements of the walls, which will be monitored as set out in both the BIA report and in Alan Baxter Partnership’s ‘Structural Design Philosophy’, with movements on cracks, which the Burland Categories relate to. As predicted movements for Burland Category 1 are cracks less than 1mm, we do not consider that setting trigger levels at/below 1mm for a system with a resolution of +/-2mm (and which is measuring wall movements, rather than crack widths) is sensible. Paragraph 4.16 of the audit report also states that “there are no actions set out within the BIA other than to stop works…”; this is not correct, because at the 5mm trigger level the BIA report states “if recorded movements in either direction reach5mm, then the frequency of readings should be increased as appropriate to the severity of the movement …” (para 10.7.3).</td></tr>
<tr><td>5</td><td>Confirmation of the volume of additional surface water run ff and the proposed means of attenuating and discharging it.</td><td>Document attached from SEnSe Associates LLP:
- SuDS Calculations 10 Clorane Gardens – May 2016</td></tr>
<tr><td>6</td><td>Further groundwater monitoring to supplement2 sampling visits undertaken in November2015.</td><td>Table as monitored by GabrielGeo Consulting:
<table><tr><th colspan="3">Table 1: Summary of groundwater monitoring records</th></tr><tr><th rowspan="2">Date</th><th colspan="2">Groundwater standing level (mbgl)</th></tr><tr><th>BH1</th><th>BH2</th></tr><tr><td>11/11/2015</td><td>2.03</td><td>2.20</td></tr><tr><td>18/11/2015</td><td>1.83</td><td>1.77</td></tr><tr><td>18/04/2016</td><td>1.83</td><td>1.75</td></tr></table></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

7	Plan showing basements to adjoining properties to demonstrate adequate groundwater flow paths	Drawing attached from Kyson: - 460-15 Neighbouring Basements

I trust the above is satisfactory, however should you require anything further please call If possible could you please also provide a timeline for Campbell Reith's assessment.

Thank you.

Kind Regards

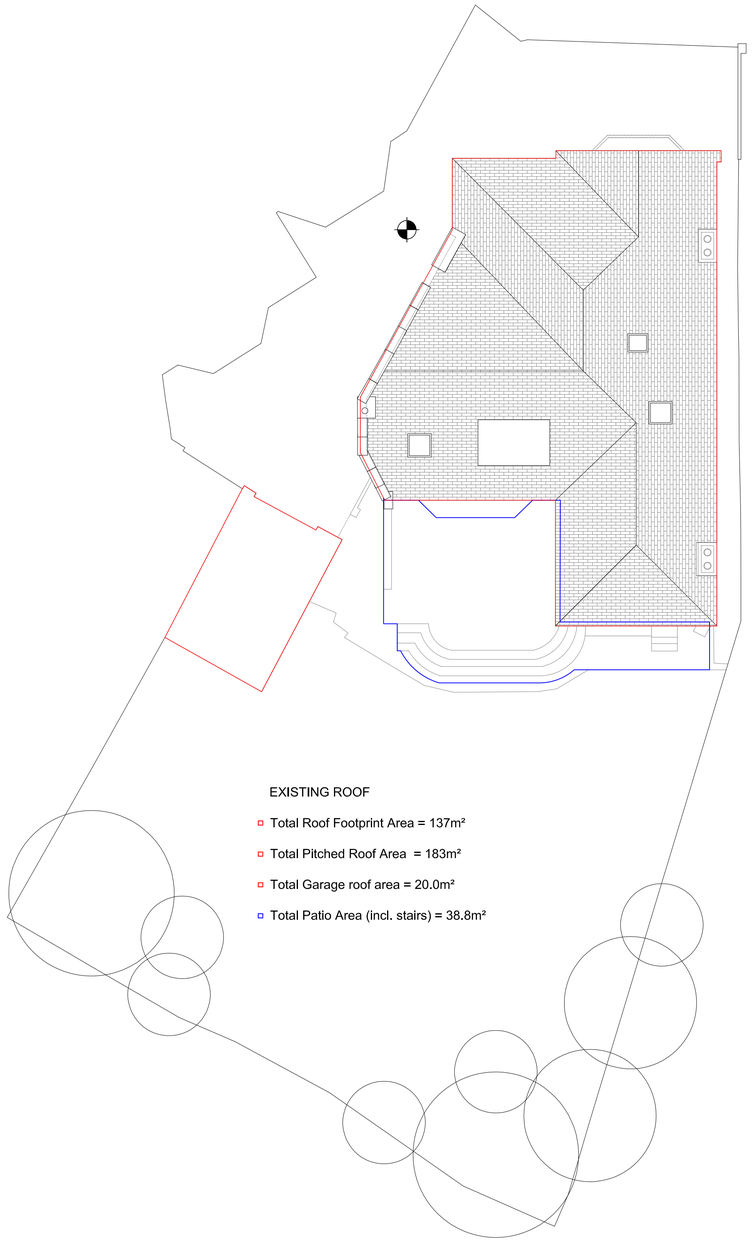
Stuart Eaves
MCIAT, MRTPI

kyson

Studio 28 Scrutton Street London EC2A 4RP
T +44(0) 20 7247 2462

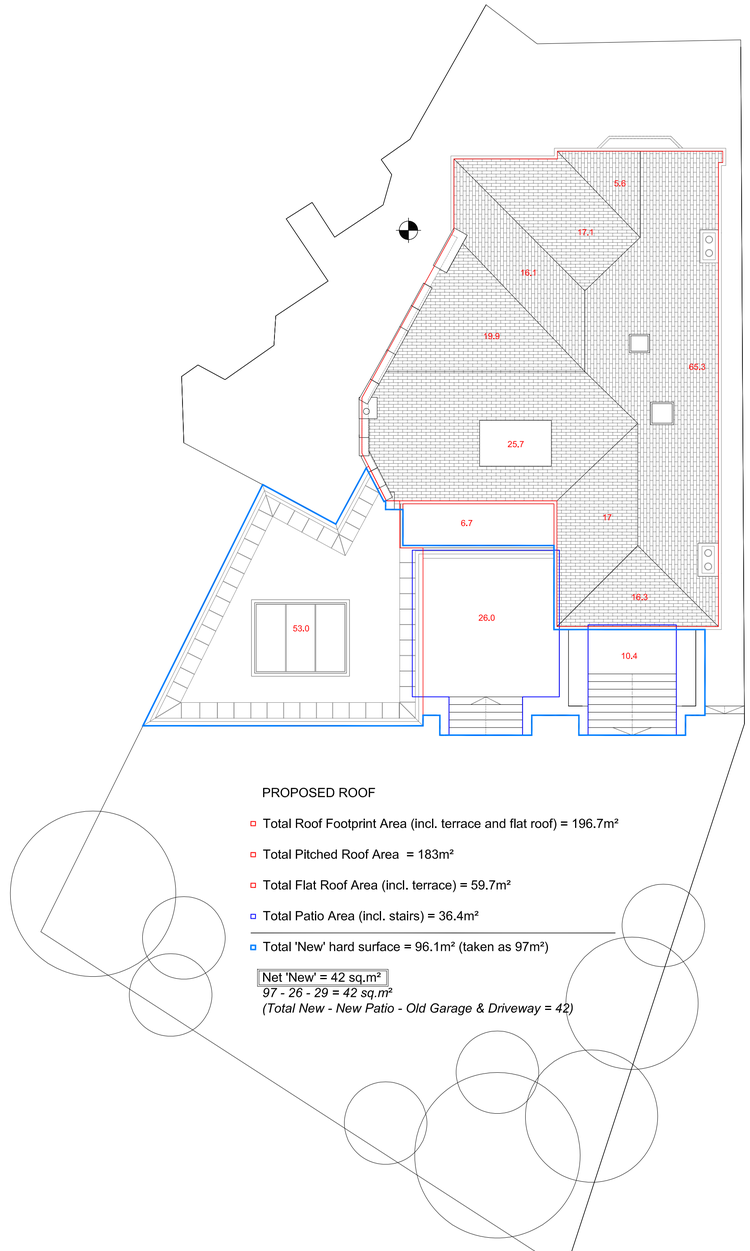
E stuart.eaves@kyson.co.uk
W www.kyson.co.uk

Europe 40 Under 40
Award Winner | 2014



EXISTING ROOF

- Total Roof Footprint Area = 137m²
- Total Pitched Roof Area = 183m²
- Total Garage roof area = 20.0m²
- Total Patio Area (incl. stairs) = 38.8m²



PROPOSED ROOF

- Total Roof Footprint Area (incl. terrace and flat roof) = 196.7m²
- Total Pitched Roof Area = 183m²
- Total Flat Roof Area (incl. terrace) = 59.7m²
- Total Patio Area (incl. stairs) = 36.4m²
- Total 'New' hard surface = 96.1m² (taken as 97m²)

Net 'New' = 42 sq.m²
97 - 26 - 29 = 42 sq.m²
(Total New - New Patio - Old Garage & Driveway = 42)

SCALE - 1:100

0 1 2 3 4 5 m

Rev:	Comments:	By:	Date:
A	Outline of 'Total New' Area	SE	Jul 16

FOR INFORMATION

Client:
Rebecca Bard

Project Title:
10 Clorane Gardens, London, NW3 7PR

Drawing Title:
Existing and Proposed Plans
Roof Plan

Scale:	Date:	Drawn:	Checked:
1:100@A1	MAY 16	EY	SB

kyson

Studio

28 Scrutton Street
London
UK
EC2A 4RP

T: +44(0) 20 7247 2462
E: enquiries@kyson.co.uk
W: www.kyson.co.uk

Project No.:	Drawing No.:	Revision:
460-15	-	A

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Michael Eldred

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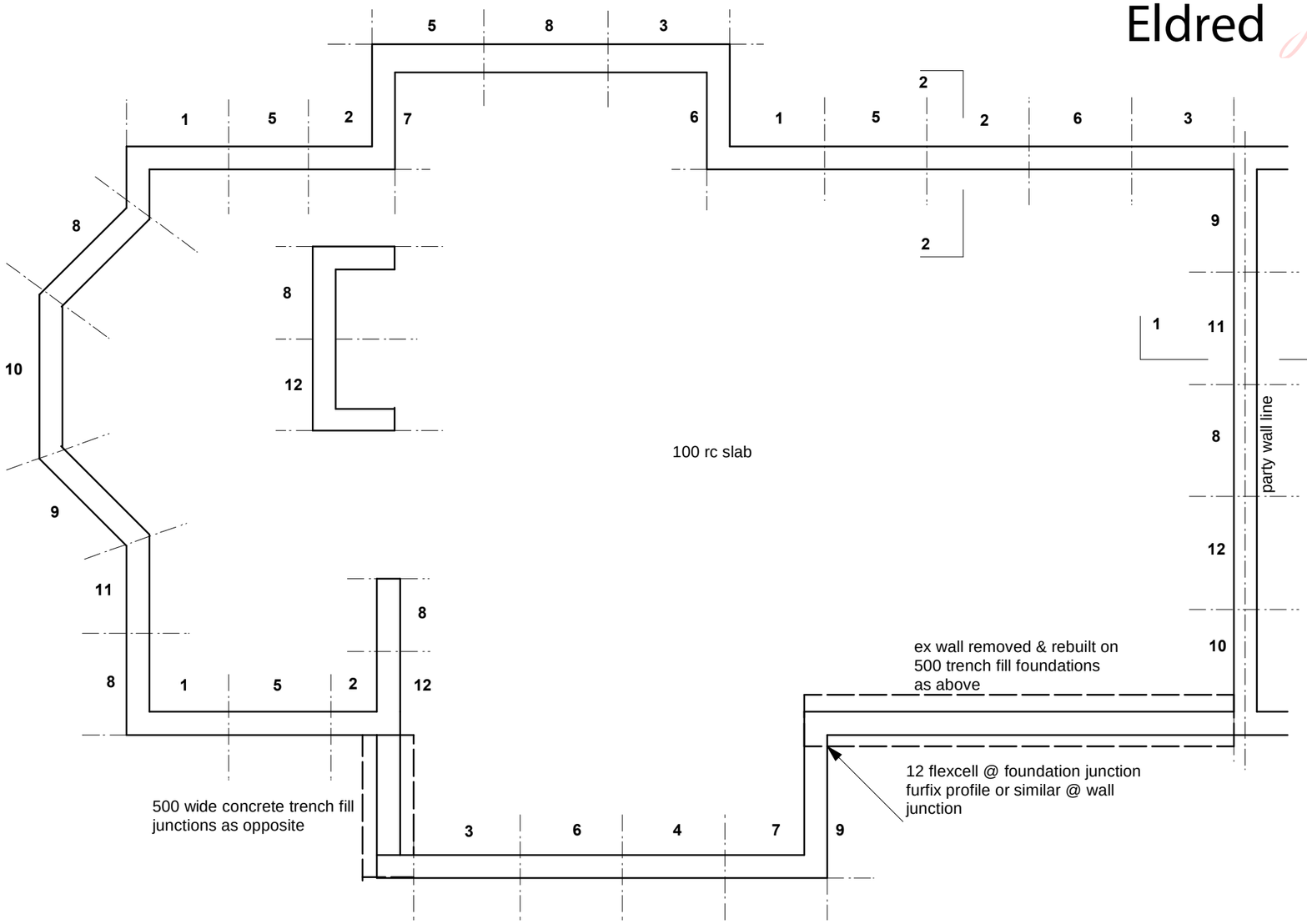
Date: 2016.06.27 15:59:44 +01'00'



underpinning sequence as shown
also refer to specification
minimum depth of trench fill to be 1000 & to DS requirements
party wall matters are to be noted

rev	amendment	date

FOUNDATIONS/LOWER GROUND FLOOR PLAN

06194-01

12 Clorane Gardens

London NW3 7PR

1:50

July 2006

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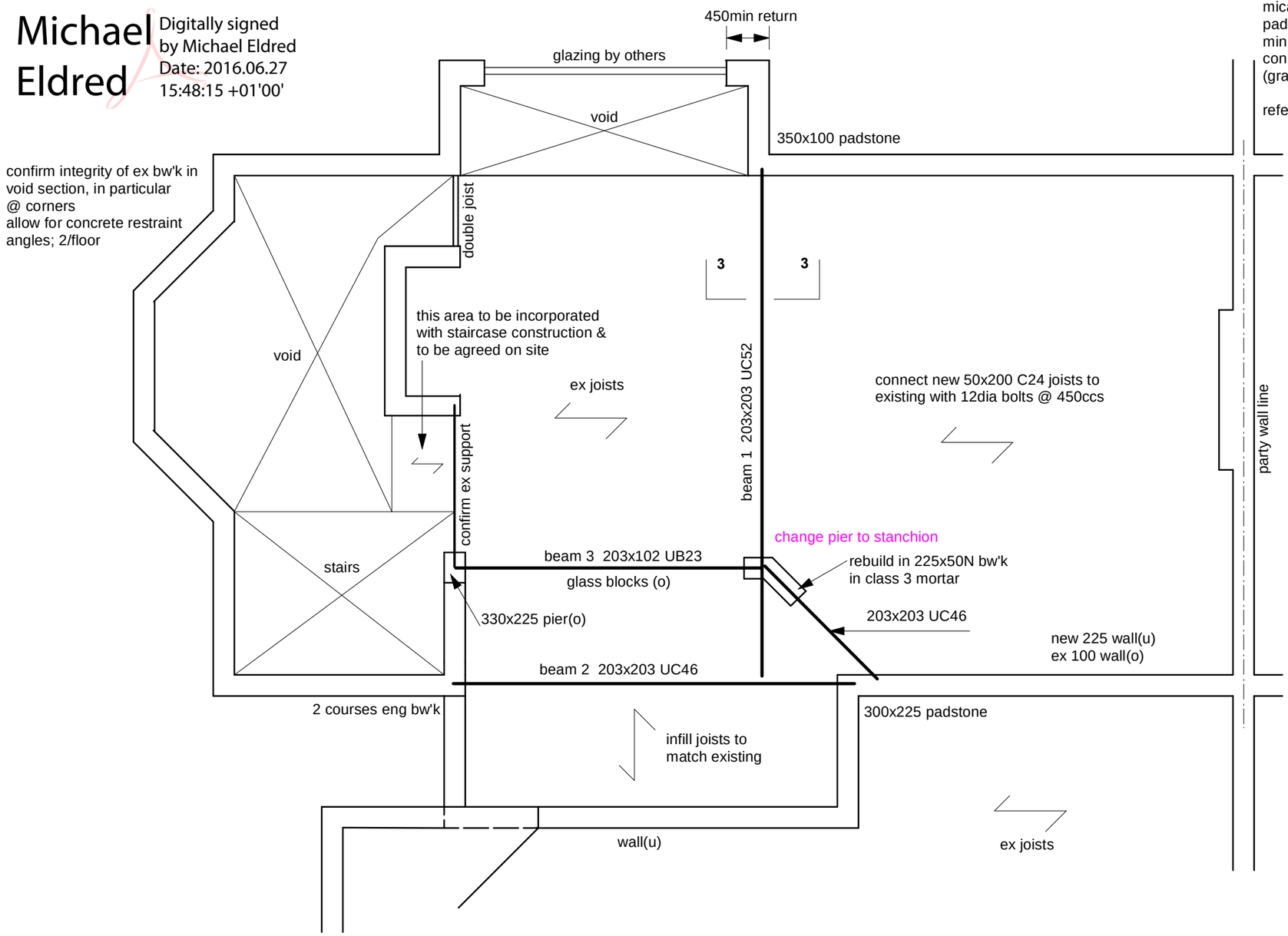
Date: 2016.06.27 15:48:15 +01'00'

drawings are to be read in conjunction with architects drawings & details
contractor to provide all necessary shoring & temporary support as found to be necessary during demolition & installation of new structure
new joists to be as shown, noggins @ one third span points for all floors, double joists connected with 12dia bolts @ 600ccs
provide double joists or noggins between joists @ stud partitions
provide 30x5 straps x 900 long @ 1.4m ccs all round perimeter to requirements of Building Inspector
double joists as trimmers for openings etc
steel to be grade S275, thoroughly hand cleaned & given 2 coats of micaceous iron oxide
padstones to be 150 deep & set in dry pack within ex bw'k
min bearings to be 100 for beams uno, 150 for lintels
connections to consist of 12 fully welded end plate, 2x2/20dia bolts (grade 8.8), flanges shaped to suit

refer also to drawing 01



GROUND FLOOR PLAN

rev	amendment	date

06194-02

12 Clorane Gardens **1:50**

London NW3 7PR **July 2006**

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Michael Eldred

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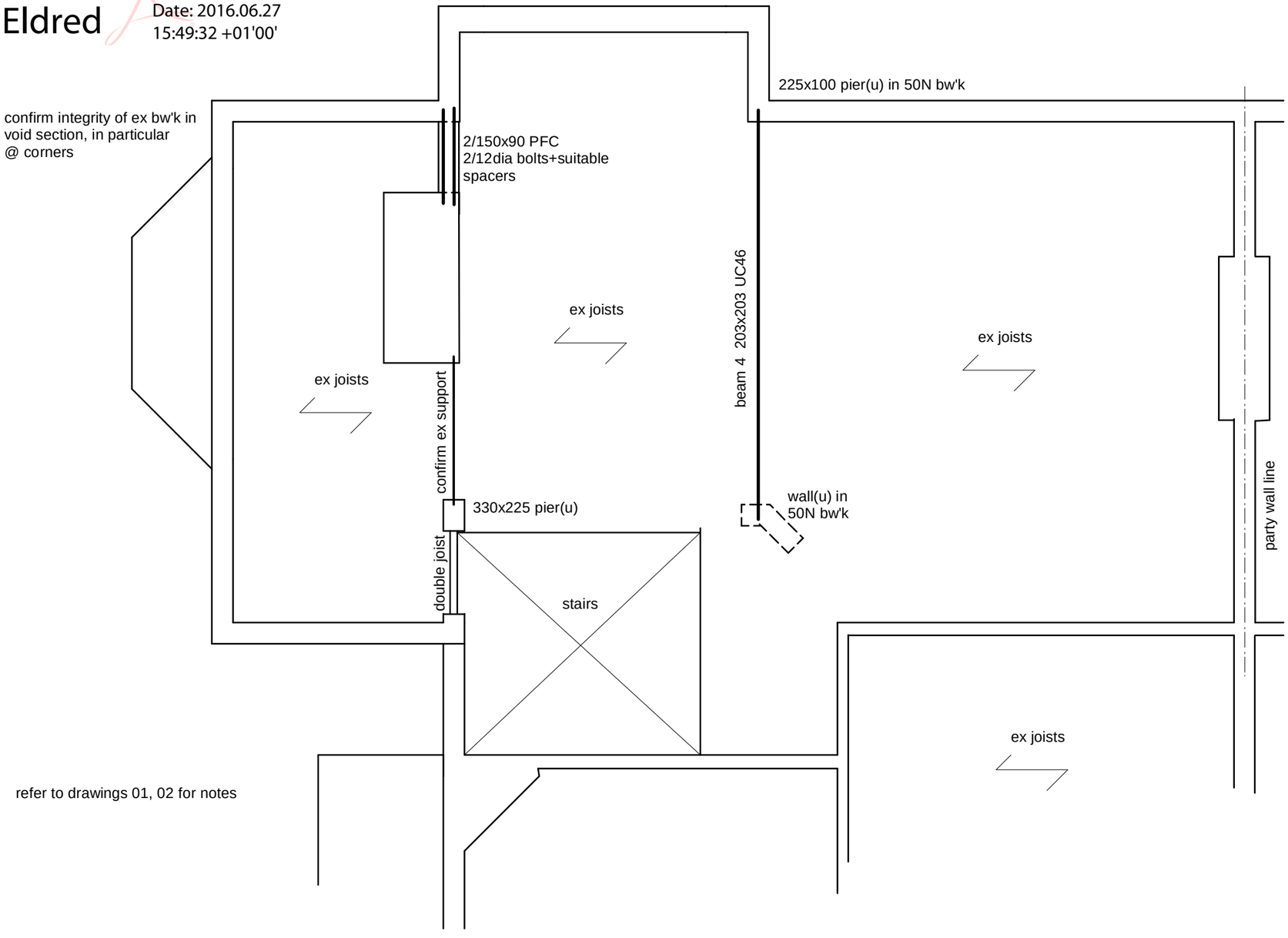
Date: 2016.06.27 15:49:32 +01'00'



refer to drawings 01, 02 for notes

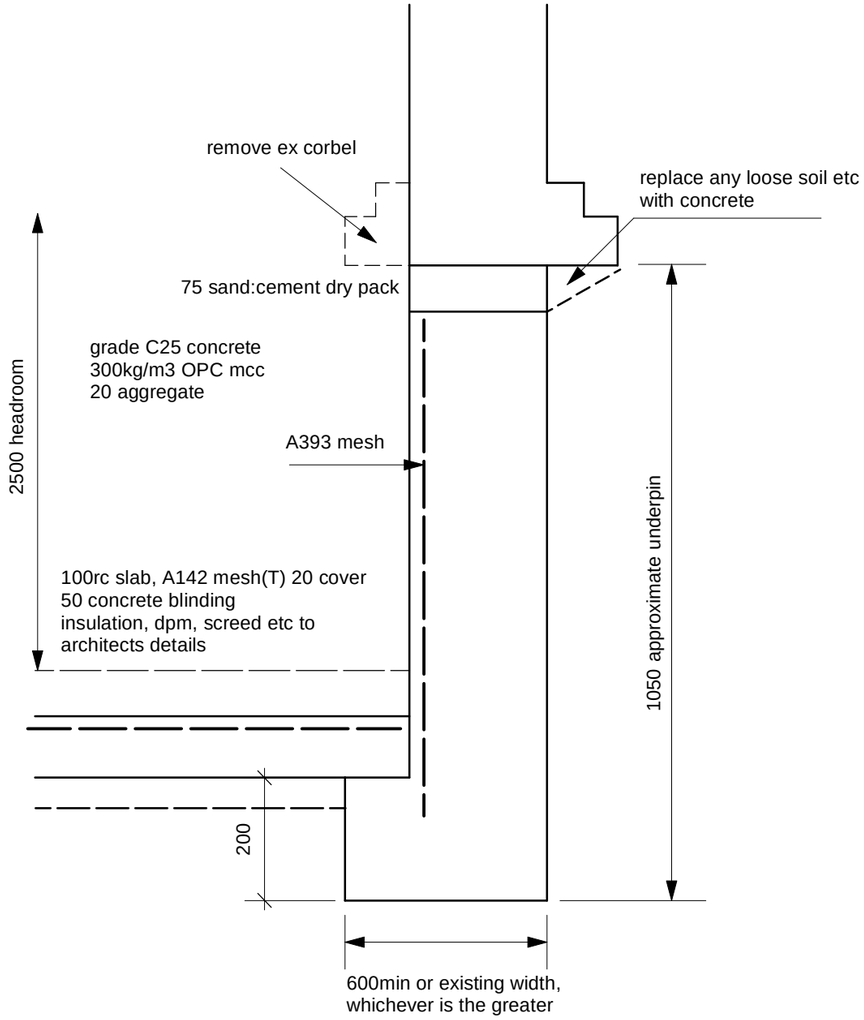
FIRST FLOOR PLAN

rev	amendment	date

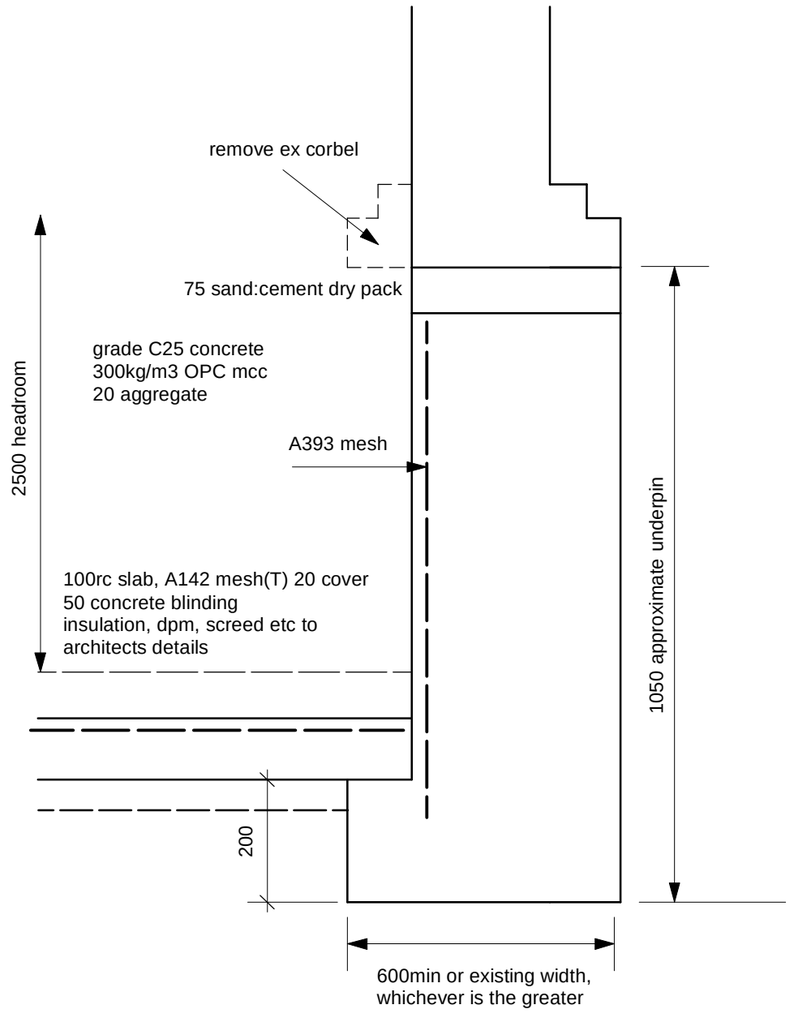
06194-03

12 Clorane Gardens **1:50**

London NW3 7PR **July 2006**



SECTION 1-1



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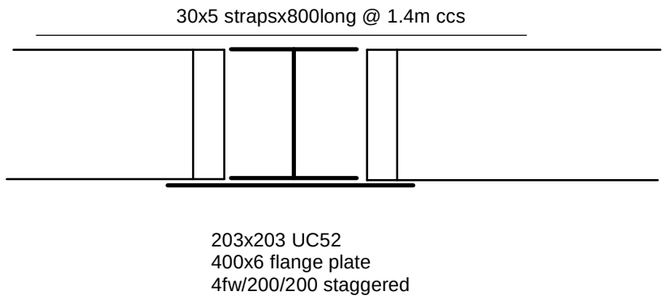

SECTION 3-3

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Michael Eldred

Digitally signed
by Michael Eldred
Date: 2016.06.27
16:03:47 +01'00'

RE: FW: 10 Clorane Gardens
Keith Gabriel
to:
'Craig, Tessa'
14/07/2016 19:10
Cc:
LizBrown, camdenaudit, "'mike summersgill'", "'Rebecca'", "'Stuart Eaves'", "'Sebastian Potiriadis'", graham, AlexGoodsell
Hide Details
From: "Keith Gabriel" <KeithG@gabrielgeo.co.uk> Sort List...
To: "'Craig, Tessa'" <Tessa.Craig@camden.gov.uk>
Cc: <LizBrown@campbellreith.com>, <camdenaudit@campbellreith.com>, "'mike summersgill'" <senseass@btopenworld.com>, "'Rebecca'" <rebecca@estateoffice.com>, "'Stuart Eaves'" <Stuart.eaves@kyson.co.uk>, "'Sebastian Potiriadis'" <seb@estateoffice.com>, <graham@abpengineers.co.uk>, <AlexGoodsell@gabrielgeo.co.uk>
Security:
To ensure privacy, images from remote sites were prevented from downloading. Show Images

4 Attachments

image001.jpg image002.jpg image003.jpg image004.jpg image005.jpg image006.jpg 06194 01 with disclaimer.pdf
06194 02 with disclaimer.pdf 06194 03 with disclaimer.pdf 06194 04 with disclaimer.pdf

Dear Tessa

Stuart Eaves has asked me to send this response directly to you. Following my conversation with Liz Brown of Campbell Reith this afternoon, and receipt of the attached rather basic drawings for No.12's underpinning from Buicon (Party Wall Surveyors), here is our response in relation to Campbell Reith's outstanding query concerning the predicted damage category for the flank wall of No.12.

The structural drawing of the underpinning for No.12's basement (Drg No.06194-01 by David A Berle Consulting Engineers, dated July 2006) shows no evidence of any transition underpins beneath the front part of No.12's flank wall. Thus, we must assume that the front 3.8m section of this wall remains supported by its original foundations, which were assumed in the BIA to be founded at the same 1.45m depth below ground level (bgl) as the footing to the front wall of No.12. This lack of stepping-up does not comply with normal good building practice. The depth of excavation for the basement below the level of the footings to No.12's flank wall would therefore be about 2.3m, and the horizontal distance between the basement and these footings widens from 1.83m at the front corners of the houses to 4.2m at the front corner of No.12's basement.

There is no simple means of assessing the damage category for this wall, because the Burland system is based on the assumption of a uniform footing depth. Based on the extensive past experience from basements constructed using underpinning methods in clays of the Claygate Member and London Clay Formation, it is known that, provided best practice methods of construction and temporary support are used, then the damage to adjoining and adjacent structures will remain within Burland Categories 0 or 1, provided also that those buildings are in sound structural condition prior to the basement works.

A crude analysis of the damage category is possible if the settlement at the front corner is assumed to equal the deflection, Δ (this is pessimistic relative to the value which would be obtained if a chord were to be drawn between the front and rear ends of the wall). The settlement at the front corner of No.12 was estimated at 3.6mm (see paragraph 10.6.15 of the BIA report) and the length of the wall is 11.75m, so the deflection ratio for vertical displacement would be 3.06×10^{-4} (0.031%). The horizontal strain for the front wall was previously assessed as $\varepsilon_h = 4.31 \times 10^{-4}$ (0.043%), but as the divergent angle between the flank walls of these two houses is 29° this strain can be reduced by a factor of 0.48 to 0.021%. Using the L/H = 1 graph of damage categories, these values fall within Burland Category 0 'negligible'.

The probable use of lime mortar in the original walls of these houses means that they can flex without cracking in response to minor foundation movement, which is beneficial, nevertheless, this numerical assessment must not be considered as rigorous; it is merely a further indicator which supports our opinion that, provided best practice methods of construction and temporary support are used and provided the wall is in a sound structural condition, then the damage to No.12's flank wall, if any, will probably remain within Burland Categories 0 or 1 despite the suspected lack of transition underpins (although that lack of stepping-up of the foundations would make the wall slightly more vulnerable to damage than would otherwise be the case).

A condition survey of No.12 should be undertaken before any excavations for the basement start, as recommended in the BIA and noted by Liz Brown below.

If you require any clarification please do ask.

London

Friars Bridge Court
41- 45 Blackfriars Road
London, SE1 8NZ

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

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

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

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

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

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com