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New basement and extensions
4 Langland Gardens,
Hampstead
London
NW3 6PY

Basement Impact Assessment Report
(Updated April 2015)

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RISQS AUDITED

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Aerial photograph of property

Approximate property boundaries edged in red.

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Report status and format

Report section	Principal coverage	Report status	
		Revision	Comments
1	Introduction and brief		
2	Description of the property and project proposals		
3	Desk study information and site observations		
4	Ground investigations		
5	External ground movements around the basement		
6	Hardened areas		
7	Tree removal		
8	Existing damage to adjacent buildings		
9	Subterranean (Groundwater flow) screening		
10	Stability impact identification		
11	Surface flow and flooding impact identification		
12	Summary and Conclusion.		

List of appendices

Appendix	Content
A	Copy of drawings illustrating proposal
B	Copy of CV of Nigel Thornton and examples of Soiltechnics commissions on basement investigations and analysis.
C	Copy of comments on this report by Chartered Geologist.
D	Borehole and trial pit records and plan showing location of exploratory points
E	Plan showing estimated surface settlement contours as a result of basement excavations (drawing 02)

1 Introduction and brief

1.1 Objectives

This report presents a Basement Impact Assessment (BIA) for a proposed development at 4 Langland Gardens in London.

The principal objective of the assessment is to present evidence to support a planning application for the project as required by Camden Planning Guidance (CPG4) '*Basements and lightwells'*.

1.2 Client instructions and confidentiality

This report has been produced following instructions received from Zen Developments.

This report has been prepared for the sole benefit of our above named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.

This report has been updated from original reports issued in December 2014 and January 2015. Updated sections of this report are shown with a vertical line in the left hand margin. The updates are limited to reporting the results of a ground investigation comprising both boreholes and trial pits used to expose foundation arrangements where access was available. A second green vertical line in the margin denotes updates following receipt of proposals from the Structural Engineer.

1.3 Author qualifications

This report has been prepared by a Chartered Civil Engineer, (C.Eng., M.I.C.E) who is also a Fellow of the Geological Society (FGS). The Author is a practising Civil Engineer with specialist experience (34 years) in geotechnical engineering (including basement construction), flood risk and drainage. A copy of my CV and examples of experience in basement construction is presented in Appendix B. This report has been reviewed by John Evans of Chord Environmental who is a Chartered Geologist and expertise in hydrogeology. It should be noted that hydrogeological aspects of this report have not been updated from our earlier reports. Copies of their comments are presented in appendix C.

1.4 Guidance used

As described in paragraph 1.1.2 above we have followed Camden Planning Guidance (CPG4) '*Basements and lightwells'*, and Camden geological, hydrogeological and hydrological study report '*Guidance for subterranean development,*' produced by Arup on behalf of the London Borough of Camden. We have also referred to the '*Strategic Flood Risk Assessment Report for North London*' dated August 2008 prepared by Mouchel, as well as other readily available information on websites.

This report has considered all four stages of the BIA process as described in CPG4. This report has also been prepared to satisfy the following parts of Camden's policy DP27, on basements and lightwells:

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;

c) Avoid cumulative impacts upon structural stability or the water environment in the local area;

In order to satisfy part a) a construction method statement has been prepared by a Structural Engineer which is separately presented.

1.5 Format of this report in relation to CPG4

Sections 3 to 8 of this report describes project proposals and presents desk study and investigation data, information required to answer flow chart questions posed in figures 1, 2 and 3 of GPG4. Answers for these flow chart questions are provided in sections 9 to 11.

2 Description of the property and project proposals

2.1 Description of the property

The site is currently occupied by a four storey semi-detached house and includes a lower ground floor. Based on inspection of old Ordnance Survey maps the house was constructed in the early 1900's. There are gardens both to the front and rear principally laid to grass with some trees. General ground levels in the area fall in a southerly direction and based on a topographical of and around the property, ground levels fall by about 4.5 degrees generally following Langland Gardens. Garden levels are reasonably uniform. The lower ground floor is located between 1 and 2.2m below surrounding garden levels.

2.2 Project proposals

Proposals are to extend the ground floor footprint into rear gardens by a distance of around 5m from the rear south facing elevation and extend the existing lower ground floor by an identical amount. Existing lower ground floor levels will be lowered by about 1.5m. A new light well is also proposed on the rear elevation providing a new lower patio area and giving access to rear gardens from the lower ground floor. A new light well is proposed on the front north facing elevation. The completed lower ground floor will provide bedroom accommodation.

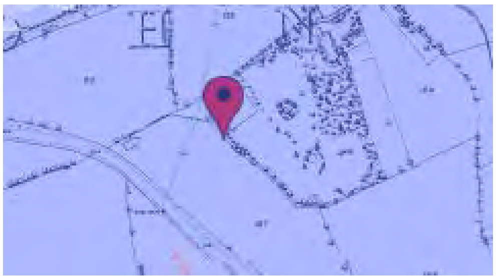
Our client's Structural Engineer proposes to underpin load bearing walls to the existing building allowing lower ground floors to be lowered. This construction method is a common (and well tried) approach for such works in ground conditions evident at the property (explored by ground investigations). A structural retaining wall will be constructed on the east and west facing walls to the extended lower ground floor, which will also support the ground floor extension.

Copies of our client's Architects and Structural Engineer's drawings showing project proposals outlining construction details are presented in Appendix A.

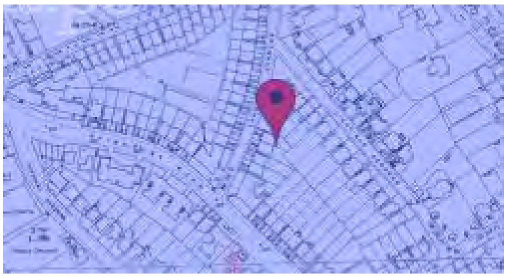
3 Desk study information and site observations

3.1 Site history

Review of Ordnance Survey and London town maps dating back to 1850s indicate the property was located on the edge of an open field / parkland until the 1930s when the current footprint of the property and surrounding buildings is recorded. Extract copies of key mapping is presented below with property position defined by the red marker.



Extract copy of 1882 map



Extract copy of 1932 map

At this stage is important to note there are no water courses recorded on the 1882 map close to the property, and no evidence of any opencast quarrying activities in the locality.

3.2 Geology and geohydrology of the area

3.2.1 Geology

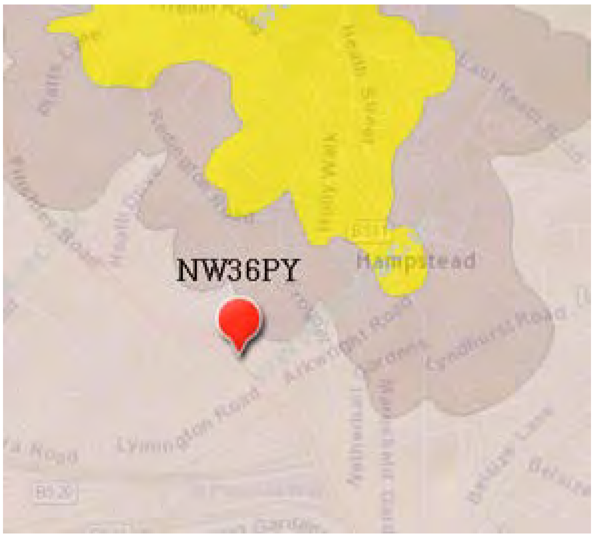
Inspection of the geological map of the area published by the British Geological Survey (BGS) indicates the following sequence of strata. The thickness of the strata has been obtained from a combination borehole record data formed within 500m of the property available on the BGS website, and geological sections shown on the BGS map.

Summary of Geology and likely aquifer containing strata					
Strata	**Bedrock or drift**	**Approximate thickness**	**Typical soil type**	**Likely permeability**	**Likely aquifer designation**
London Clay Formation	Bedrock	80	Clays	Low	Unproductive
Lambeth Group	Bedrock	16	Clays occasionally sandy	Low	Unproductive
Thanet sands	Bedrock	10	Fine sands	Low/moderate	Secondary Aquifer
Chalk	Bedrock	200	Chalk	High	Principal

Table 3.2

Soil types and assessments of permeability are based on geological memoirs, in combination with our experience of investigations in these soil types.

An extract copy of the geological map is presented below, with brown shading representing the outcrop of the London Clay Formation. The yellow represents the Bagshot Beds which overlie the Claygate beds shaded dark brown (both on higher ground to the north) with the property located on London Clays (light brown shading). The property position is shown by the red marker.



Based on the above any excavations within the property will be located within London Clays, however is it is acknowledged that a covering of made ground is inevitable associated with development of the area.

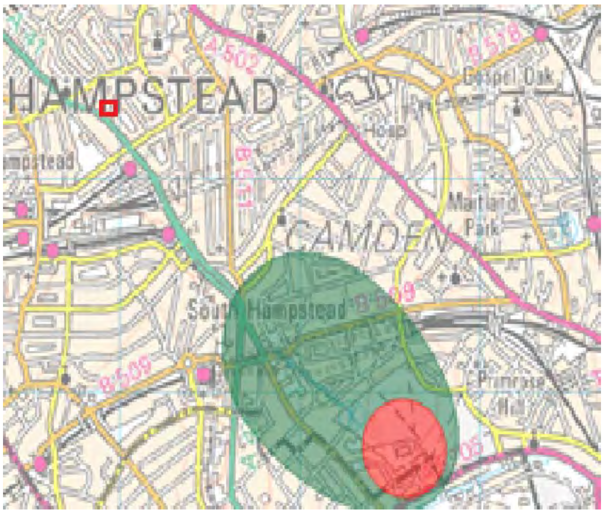
3.2.2 Geohydrology

The London Clay is classified as unproductive and regarded as not containing groundwater in exploitable quantities.

Chalk is classified a Principal Aquifer. Principal aquifers are defined as deposits exhibiting high permeability capable of high levels of groundwater storage. Such deposits are able to support water supply and river base flows on a strategic scale.

3.2.3 Source protection zone

The site is not recorded as being located within or close to a zone protecting a potable water supply abstracting from a principle aquifer (i.e. a source protection zone). An extract of the plan recording source protection zones is presented below, with green shading representing outer protection zones and red inner protection zones. The property is located within the red square and remote from source protection zones.



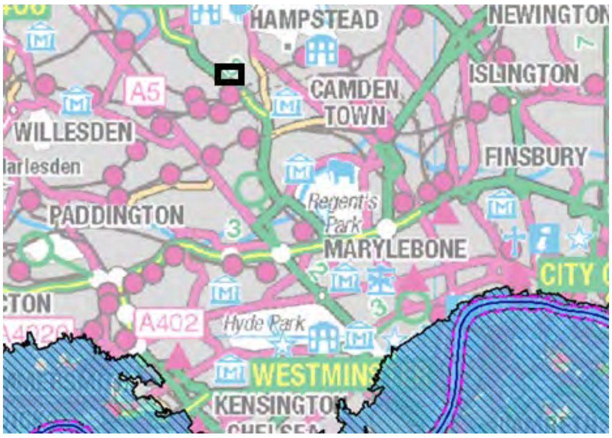
3.3 Quarrying/mining

3.3.1 With reference to the coal mining and brine subsidence claims gazetteer for England and Wales, available on the Coal Authority web site, the area has not been subject to exploitation of coal or brine. Inspection of old Ordnance Survey maps dating back to the first editions (late 1800s) does not record any quarrying activities within 250m of the property.

3.4 Flood risk

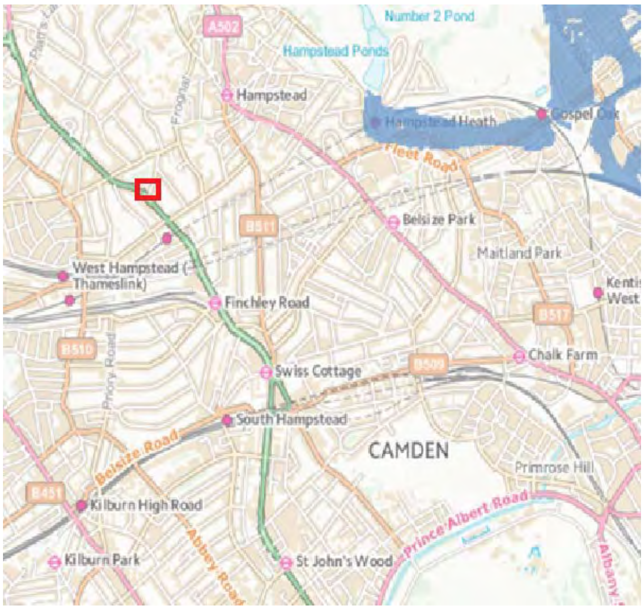
3.4.1 Fluvial/tidal flooding

The Environment Agency website indicates the site is not located within a fluvial or tidal flood plain. An extract copy of the flood risk map is presented below which shows no blue shading representative of flooding. The property is located within the black square.



3.4.2 Flooding from Reservoirs, Canals and other Artificial Sources

The Environment Agency website indicates the site is not located within an area considered at risk of flooding from breach of reservoir containment systems. An extract copy of the flood risk map is presented below which shows no blue shading representative of flooding as a result of failure of containment systems close to the site. The property is located within the red square.



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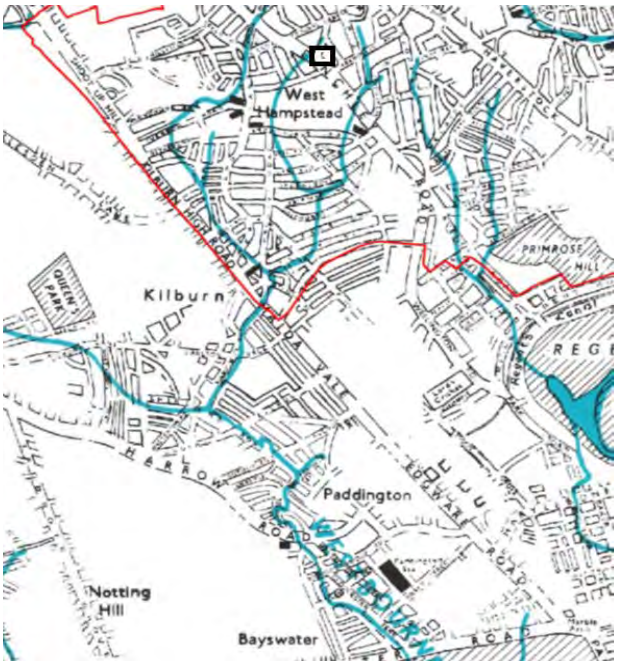
3.4.3 Flooding from Groundwater and surface waters

The site is underlain with a substantial thickness (70m) of relatively impermeable London Clay Formation. On this basis groundwater is not likely to be available at the site and thus is unlikely to present a risk of causing groundwater flooding.

We have viewed the Environment Agency web site which provides maps showing areas a risk of flooding from surface waters. An extract of the map is presented below. The property is located within the red circle and blue shading represents areas at risk of surface water flooding. The property is remote from blue shaded areas.

An extract of figure 11 from the Camden Geological, Hydrogeological and Hydrological Study (referenced in Section 1.4) is presented below. The blue lines show the locations of branches of the former River Westbourne (immediately to the south of the property). The property is located within the black box. The property seems to be at the head waters of an upper branch of the Westbourne.



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With reference to old mapping of the area described in section 3.1 above, the 1882 map (predevelopment) does not record any water courses close to or within the immediate area of the property. The Westbourne was a natural stormwater drainage system for this area of London prior to urbanisation. Development of London has resulted in original watercourses being culverted, with culverts following, in the majority of cases, road infrastructure routes.

There are no major culverts in Langland Gardens recorded on Thames Water Asset register, an extract copy of which is presented below. There is a 305mm diameter combined sewer in the road outfalling into a larger sewer in lower topography to the south.

An extract of figure 15 from the Camden Geological, Hydrogeological and Hydrological Study (referenced in Section 1.4) is presented below (property marked in a red box). The map records Langland Gardens was subject to flooding in 1975, but not in 2002. Importantly Langland Gardens falls in a southerly direction at a reasonably consistent gradient of around 1 in 12 (4.5 degrees) to Finchley Road some 50m distant. Although Langland Gardens may have been subject to some flooding it is considered unlikely (given the gradient of the Road) that flooding would have affected the subject property.

Extract copy of figure 15 from the Camden Geological, Hydrogeological and Hydrological Study

There will be below ground water supply pipes operated by Thames Water in public highways around the property. These are generally relatively small diameter pipes. It is considered that the property is unlikely to be at enhanced risk of flooding due to ruptures in the potable water supply system in the area.

3.4.4 Conclusions

Based on the above, in our opinion, the property is considered unlikely to be at enhanced risk of being flooded by exceedences in capacity of foul and stormwater drainage or water supply pipes. Evidence presented above demonstrates the property is not at an enhanced risk of being affected by tidal or fluvial flooding or indeed from artificial sources. The property and indeed proposals will not be affected by groundwater flooding

4 Ground investigations

4.1 Scope

Two boreholes have been excavated at the property; one in rear gardens to 6m depth (DTS01) and one in front gardens to 5m depth (DTS02). In two hand dug trial pits have been excavated one (TP01) in rear gardens to determine the presence or absence of shallow concrete below a rockery and one to expose foundation arrangements of the existing building. The scope of the investigations was determined in conjunction with our Client's Structural Engineer but also to support this report.

Fieldwork records together with a plan showing the location of exploratory points are presented in appendix D.

4.2 Ground conditions encountered

Each of the two boreholes encountered a similar soil profile of naturally deposited London Clays capped with a thin covering of made ground extending to depths of 0.6m (rear gardens) and 0.9m (front gardens). The London Clays essentially comprised medium strength brown grey silty clays. No groundwater was encountered in the excavations. A water level monitoring standpipe was installed to full depth of each borehole and on a return visit to site no water was observed in the standpipe.

The investigations confirmed published geological maps for the near surface geology.

4.2 Foundations

A trial pit was excavated externally along the north facing wall of the house. The excavation exposed a brickwork corbel onto a concrete trench fill type foundation. Unfortunately access was very constrained and the excavation could not be progressed below 1.05m, however the type of foundation was established and it is constructed on naturally deposited London Clays.

Based on investigations completed to date we are of the opinion that the London Clays will adequately support new spread type foundations including traditional underpinning to existing spread type foundations to facilitate lowering of existing basement floor levels.

5 External ground movements around basement

5.1 Construction proposals

Proposals are to extend the ground floor footprint into rear gardens by a distance of around 5m from the rear south facing elevation and extend the existing lower ground floor by an identical amount. Existing lower ground floor levels will be lowered by about 1.5m. A new light well is also proposed on the rear elevation providing a new lower patio area and giving access to rear gardens from the lower ground floor. A new light well is proposed on the front north facing elevation. The completed lower ground floor will provide bedroom accommodation. On this basis basement excavations will be in two parts, lowering existing lower ground floor by about 1.5m (including floor construction), and extending the basement into rear gardens resulting in an excavation of around 3m (say 3.2m to allow for floor construction).

Our client's Structural Engineer proposes to underpin load bearing walls to the existing building allowing lower ground floors to be lowered. A structural retaining wall will be constructed on the east and west facing walls to the extended lower ground floor, which will also support the ground floor extension.

5.2 Settlement around and inward yielding of basement excavations

The following analysis is based on observations of ground movements around basement excavations in clays as reported in Tomlinson '*Foundation design and construction*' (seventh Edition)

It is recognised that some inward yielding of supported sides of strutted excavations and accompanying settlement of the retained ground surface adjacent to the excavation will occur even if structurally very stiff props / strutting is employed. The amount of yielding for any given depth of excavation is a function of the characteristics of the supported soils and not the stiffness of the supports. Based on observations of other excavations in over consolidated clay soils (which is the case at this site) the average maximum yield / excavation depth (%) was 0.16, with a range of 0.06 to 0.3. Assuming a maximum excavation depth of 3.2m then the likely inward yield will be in the order of 3.2 x 0.16/100 x 1000 = 5mm. . Similarly considering the effects of lowering the existing basement floor by 1.5m, theoretical inward yielding will be about 2.5mm.

Coincidental with the inward yield, some settlement of the retained soils around the excavation will occur. Again, based on published observations, the ratio of surface settlement to excavation depth in over consolidated clays is about 0.3% (range 0.1 to 0.6). Adopting the average of 0.3, and a maximum 3.2m deep excavation, then surface settlement in the order of 3.2 x 0.3/100 x 1000 = 9mm will occur. Importantly, whilst some surface settlement will occur around the excavation, this settlement profile will extend for a distance of about 4 times the depth of excavation ie about 13m in a reasonably linear fashion. Similarly for the case of lowering the existing basement floor by around 1.5m, surface settlement will be about 4.5mm and diminish over a distance of around 6m outside the basement perimeter.

We have produced a plan showing estimated surface settlement contours considering the two basement excavations which is presented on drawing 02 in appendix E.

The adjacent properties are likely to include basements similar to that which exists at no 4.

The adjoining property at No2 will be most affected (in terms of the effects of surface settlement) by the basement excavations. No 2 extends to a width of about 10m. Considering surface settlement of 9mm which diminishes over a horizontal distance of 13m, we estimate the horizontal strain will be about 0.038% on the main rear elevation of No2. This would suggest damage would fall into category 0 as described in the following table (extract from CIRIA report 580). Taking into account the combined effects of inward yield and settlement, category 1 damage may occur, but locally to the rear quadrant of No2.

Table 2.5 *Classification of visible damage to walls (after Burland et al, 1977, Boscardin and Cording, 1989; and Burland, 2001)*

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 but also depends on number of cracks	> 0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Notes

1. In assessing the degree of damage, account must be taken of its location in the building or structure.
2. Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

6 Hardened areas

There will be an increase in hardened and drained areas resulting from the development. The property is underlain with a substantial thickness of relatively impermeable London Clays, which is not amenable to disposal of stormwater using soakaways. Proposals are to intercept roof drainage systems (rain water down pipes), and install a hydrobrake limiting flows to match current rain water run off, and attenuate any additional water on site in a below ground storage facility, probably located in rear gardens. On this basis the development will not increase that rate of discharge to stormwater to sewers and thus not contribute to flood risk downstream of the property.

7 Tree removal

No major vegetation will be removed to accommodate the extension building.

8 Existing damage to adjacent buildings

We are not aware of any subsidence damage to existing buildings.

9 Subterranean (Ground water) flow screening

9.1 General overview.

The property is positioned on locally high ground known as Highgateto the north-west of central London. The property is outside areas considered to be at risk of being affected by tidal and fluvial flooding associated with the Thames or its tributaries, or artificial water sources (canals/reservoirs). In addition the property is not considered to be at enhanced risk of flooding from sewers or water supply pipes.

Geological records indicate the site is underlain by deposits of London Clay Formation extending to depths of approximately 80m. The property (being underlain with a substantial thickness of London Clay Formation) is not considered to be at risk of flooding from groundwater and the proposals will not affect any groundwater flows.

9.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 1 of CPG4

Question and response		**Text reference**
Question 1a	Is the site located directly above an aquifer?	
Response.	No. The property is directly underlain by over 80m thickness of London Clays which are classified Unproductive Strata (formerly Non Aquifer) by the Environment Agency.	3.2
Question 1b	Will the proposed basement extend beneath the water table surface?	
Response	No. The London Clay Formation comprises reasonably homogenous relatively impermeable clays which are not able to transmit groundwater under normal hydraulic gradients.	3.2
Question 2	Is the site within 100m of a watercourse, well or potential spring line?	
Response.	Yes. The site is remote (in excess of 100m) of any known watercourse although it is likely a tributary of the River Westbourne has been incorporated into the sewer system along Langland Gardens. The geology of the area is not conducive to spring lines or wells for extraction of water. Based on this there are no matters of concern.	3.4.3

Question and response		Text reference
Question 3	Is the site within the catchment of the pond chains on Hampstead Heath?	
Response	No. Based on figure 14 within the Camden geological, hydrogeological and hydrological study report, the property is not within the catchment of the pond chains on Hampstead Heath. The property is located about 1.4km distance from the pond chains on Hampstead Heath	3.4.2
Question 4	Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	
Response	Yes. The extensions to the property will increase the hardened area of the site, however proposal are to manage on site stormwater collected by the development so as not to increase the rate of stormwater discharge to sewers off site.	5
Question 5	As part of the site drainage, will more surface water (e.g. rainfall and run off) than present be discharged to the ground (e.g. via soakaways/SUDS)?	
Response	No. The site is underlain by London Clays which are not amenable to disposal of stormwater using infiltration systems. Rainwater falling onto the garden area will be disposed of using natural absorption and natural run off (which is currently the case).	5
Question 6	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	
Response	No. The London Clay Formation comprises reasonably homogenous relatively impermeable clays which are not able to transmit groundwater under normal hydraulic gradient. Basement excavations will be formed in the London Clays. Based on this there are no matters of concern.	3.4.3

10 Stability impact identification

10.1 General overview.

The property is positioned on locally high ground to the north-west of central London. Ground levels in the area fall in a general southerly direction (down Langland Gardens) at a slope of 4.5 degrees.

No trees will be removed as part of the development

Proposals are to extend the ground floor footprint into rear gardens by a distance of around 5m from the rear south facing elevation and extend the existing lower ground floor by an identical amount. Existing lower ground floor levels will be lowered by about 0.7m. A new light well is also proposed on the rear elevation providing a new lower patio area and giving access to rear gardens from the lower ground floor. A new light well is proposed on the front north facing elevation.

10.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 2 of CPG4

Question and response		Text reference
Question 1	Does the existing site include slopes, natural or manmade greater than 7^{o} (approximately 1 in 8).	
Response.	No. The topography of the area falls by about 4.5 degrees in a southerly direction. Based on this there are no matters of concern.	2.1
Question 2	Will the proposed profiling of landscaping at the site change slopes at the property boundary to more than 7^{o}?	2.2
Response	No. The proposed basement will not change the current topographical conditions. Based on this there are no matters of concern.	
Question 3	Does the development neighbour land including railway cuttings and the like with slopes greater than 7^{o} (approximately 1 in 8)?	
Response.	No. The topography of the area falls by about 4.5 degrees in a southerly direction, and there are no manmade cuttings in the area. Based on this there are no matters of concern.	2.2

Question and response		Text reference
Question 4	Is the site within a wider hillside setting in which the slope is greater than 7^{O}?	
Response	No. The topography of the area falls by about 4.5 degrees in a southerly direction with the slope (down Langland Gardens) being reasonably uniform. Based on this there are no matters of concern.	2.1
Question 5	Is the London Clay the shallowest strata at the site?	
Response	Yes. The property is underlain with London Clays, extending to depths of around 80m in the area. Given the shallow (natural) slope angles in the area, the property is not considered to be at risk of slope instability. Based on this there are no matters of concern.	2.1
Question 6	Will any trees be felled as part of the development and/or are there any works proposed within any tree protection zones where trees are to be retained?	
Response	No trees will be removed as part of the development.	6
Question 7	Is there a history of any seasonal shrink swell subsidence in the local area and/or evidence of such effects on site?	
Response	No. We are not aware of any evidence of damage attributable to subsidence either on the subject property or on adjacent properties. Based on this there are no matters of concern.	
Question 8	Is the site within 100m of a watercourse, well or potential spring line.	
Response	Yes. The site is close to a potential tributary of the former River Westbourne. There is no evidence of any recorded watercourses on old Ordnance Survey maps within or close to the property. If there was a water course this will have now been incorporated into the local sewer system in Langland Gardens. The geology of the area is not conducive to spring lines or wells for extraction of water. Based on this there are no matters for concern.	3.4.3

Question and response		Text reference
Question 9	Is the site within an area of previously worked ground?	
Response	No. There is no evidence to indicate the site has been subject to quarrying activities in the area. Based on this there are no matters of concern.	3.3.1
Question 10	Is the site located above an aquifer? If so will the proposed basement extend beneath the water table such that dewatering may be required during construction?	
Response	No. The property is directly underlain by over 80m thickness of London Clays which are classified Unproductive Strata (formerly Non Aquifer) by the Environment Agency. The London Clay Formation comprises reasonably homogenous relatively impermeable clays which are not able to transmit groundwater under normal hydraulic gradient. New basement excavations will be formed in the London Clays. Based on this there are no matters of concern.	3.2
Question 11	Is the site within 50m of Hampstead Heath ponds?	
Response	No. The property is located about 1.4km to the west of the pond chain on Hampstead Heath. Based on this there are no matters of concern.	3.4.2
Question 12	Is the site within 5m of a public highway or pedestrian right of way?	
Response.	No. The proposed basement will not be located within 5m of a public highway/footway. Based on this there are no matters of concern.	2.2

Question and response		Text reference
Question 13	Will the proposed basement significantly increase the differential depth of foundations relative to adjacent properties?	
Response	No. Traditional underpinning will be used to extend existing foundations down to proposed lower ground floor levels, possibly extending existing foundation depths down by around 1.5m. Although there will be differences in ground / basement level floors between the new build and adjacent properties, the proposed basement construction solution will not affect neighbouring properties, and estimates of movements which may occur during the construction phase are described in section 5 which indicate acceptable levels of differential movement. Based on this there are no matters for concern. A copy of the project Engineer's drawings illustrating proposed foundations for the basement are presented in Appendix A.	4
Question 14	Is the site over (or within the exclusion zone of) any tunnels e.g. Railway lines.	
Response	No. The property is not located within 50m of an underground railway. Based on this there are no matters of concern.	

11 Surface flow and flooding impact identification

11.1 General overview.

There will be an increase in hardened and drained areas resulting from the development. The property is underlain with a substantial thickness of relatively impermeable London Clays, which is not amenable to disposal of stormwater using soakaways. Proposals are to intercept roof drainage systems (rain water down pipes), and install a hydrobrake limiting flows to match current rain water run off, and attenuate any additional water on site in a below ground storage facility, probably located in rear gardens. On this basis the development will not increase that rate of discharge to stormwater to sewers and thus not contribute to flood risk downstream of the property.

11.2 Responses to flow chart questions

The following provides site specific responses to questions posed in figure 3 of CPG4

Question and response		Text reference
Question 1	Is the site within the catchment of the pond chains on Hampstead Heath?	
Response.	No. The property is not located within the catchment of the pond chains.	3.4.2
Question 2	As part of the site drainage, will surface water flows (e.g. rainfall and run off) be materially changed from the existing route?	
Response	No. Proposals will not have a material impact on surface water flows.	5
Question 3	Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	
Response.	Yes. Refer 11.1 above.	11.1
Question 4	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream water courses?	
Response	No. Proposals will have no impact on surface water received by adjacent properties or downstream watercourses.	11.1

Question and response		Text reference
Question 5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream water courses?	
Response	No. Proposals will have no impact on surface water flows to adjacent properties or downstream water courses.	11.1

12 Summary and Conclusions

12.1 Existing lower ground floor levels will be reduced by around 1.5m and the lower ground floor footprint extended into rear gardens. Light wells will be provided both in front and rear gardens. Proposals include the addition of a single storey extension at ground level.

12.2 Old mapping of the area records the site in open field / parkland in the late 1800s and early 1900s. There is no evidence of any watercourses or ponds close to the site. The existing property footprint is first recorded on the 1935 map.

12.3 Published BGS maps of the area record topography local to the property is formed in deposits of London Clays which probably extend to depths in the order of 80m in the area. The London clays are classified as unproductive strata (formerly Non Aquifer) by the Environment Agency. Boreholes formed at the site confirm the site ios directly underlain with London Clays. The London Clay Formation comprises reasonably homogenous relatively impermeable clays which are not able to transmit groundwater under normal hydraulic gradient. Basement excavations will be formed in the London Clays and based on the above, not affected by groundwater. Similarly, installation of the proposed basement will not affect any subterranean ground water flows.

12.4 Ground levels do fall in a southerly direction by about 4.5 degrees, and slope instability is not considered to present a risk. Installation of the basement will not induce any slope instability.

12.5 There is no evidence of any subsidence to any adjacent properties or indeed the existing buildings on the site.

12.6 Two trees will be removed which are growing close to the rear (South Eastern) garden boundary. Removal of these trees will not affect nearby properties.

12.7 Installation of the basement will generate some ground movement close to the perimeter of the basement excavation. The amount of movement has been predicted based on records of observed movement in other basements during construction. The amount of movement is relatively small which do not present a matter of concern to adjacent properties.

12.8 The property is considered to be at no enhanced risk of being subject to flooding.

12.9 There will be an increase in hardened and drained areas resulting from the development. The property is underlain with a substantial thickness of relatively impermeable London Clays, which is not amenable to disposal of stormwater using soakaways. Proposals are to intercept roof drainage systems (rain water down pipes), and install a hydrobrake limiting flows to match current rain water run off, and attenuate any additional water on site in a below ground storage facility, probably located in rear gardens. On this basis the development will not increase that rate of discharge to stormwater to sewers and thus not contribute to flood risk downstream of the property.

12.10 The site is remote from underground tunnels.

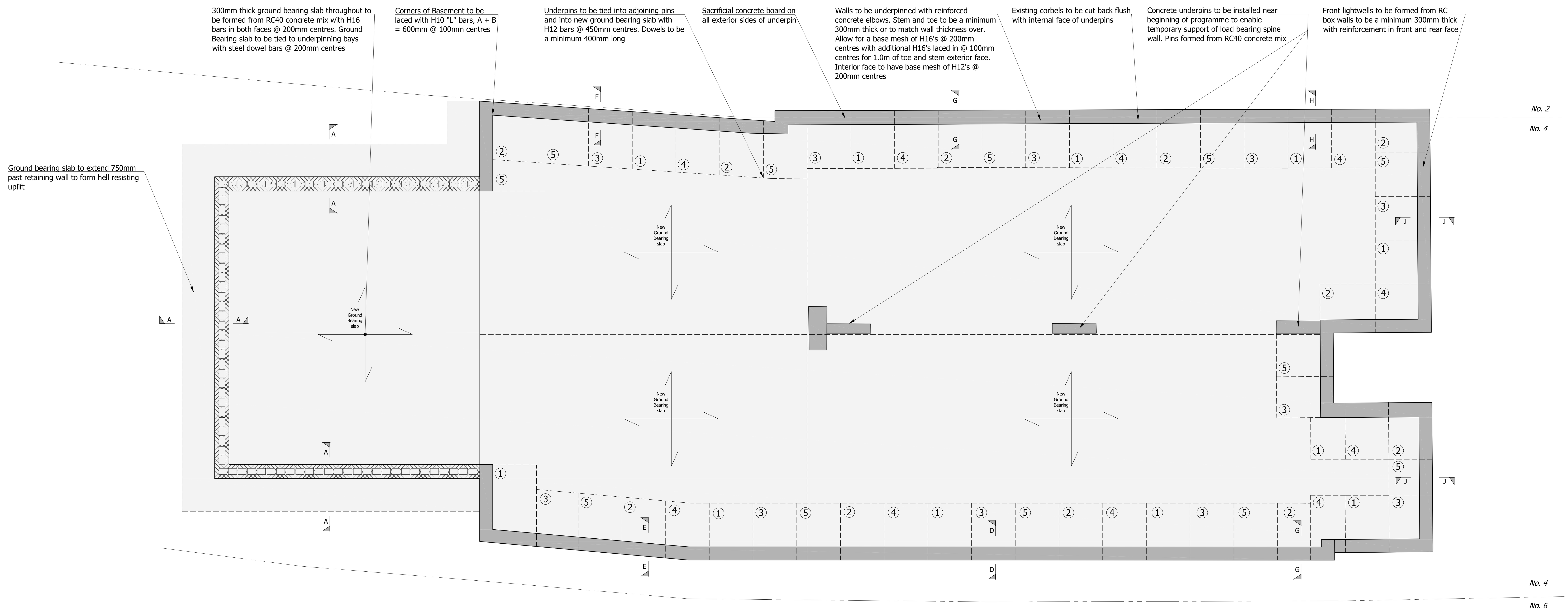
12.11 In overall conclusion there are no outstanding issues of concern (singularly or cumulatively) from a stability, groundwater or surface water perspective.

DO NOT SCALE FROM THIS DRAWING

All dimensions to be verified on site before commencing work. All errors and omissions are to be reported to the Engineer. This drawing is to be read in conjunction with all relevant Design Team drawings and specifications.

Drawing History

REV	DATE	DESCRIPTION	DRAWN	CHKD
P1	12.03.15	Issued for Comment	JG	JS



UNDERPINNING SPECIFICATION

The underpinning has been designed so that the maximum bearing pressure is 200 KN/m2 (SLS) based on medium dense sand and gravel indicated on borehole logs local to the site. Should the ground conditions found to be different the structural engineer must be informed prior to the casting of the underpinning.

The Contractor is to be responsible for the accurate construction of the works according to the true intent of the Engineer's drawings and this specification.

The Contractor is to consider the need for any temporary works required to ensure the stability of the walls underpinned and provide any needling, dead shoring, propping etc. as may be appropriate.

The underpinning legs are to be constructed in the stages indicated on the drawing. Should the contractor wish to undertake the works in different stages this must be agreed with the engineer prior to undertaking the works

The excavation works are to be undertaken carefully so that the existing footings are not disturbed. Excavations are to be temporarily supported as necessary

When excavating for an underpinning leg, if any deviation is found in the nature of the bearing strata, or if obstacles or obstructions are encountered, the facts are to be reported to the Engineer.

All underpinning legs should have keys formed in them for bonding into succeeding legs as indicated on the Engineer's drawing.

A minimum of 48 hours after concreting a leg of underpinning, the footings above may be pinned up.

The pinning concrete is to be driven into place using hand held hammer and a 75 mm square hardwood drift against a substantial timber, secured on far side of footing.

Concreting and pinning-up must be completed before starting to excavate the next section of underpinning in the sequence.

Underpinning legs should preferably be concreted on the same day as they are excavated. If it is necessary to leave them open overnight temporary works and timbering are to be used to ensure that all is secure. On no account are underpinning legs to be left open over the weekend.

Particular care is to be taken to clean off and if necessary hack or scabble side of previously cast legs to provide adequate bond before concreting subsequent legs.

If water is encountered in excavation the Contractor is to providesumps, grips and pumps as necessary to keep the excavations free from water at all times.

Materials

The concrete used in underpinning legs shall be grade C30 in accordance with BS5328, with a minimum cement content of 330 kg/m^3 or a 1:1.5:3 prescribed mix using 20 mm maximum aggregate, subject to proper ganging facilities being available on site.

Pinning concrete shall be approximately 75 mm thick pea-shingle concrete 1:1:5:3 mixing using 5 mm - 10 mm coarse aggregate and "Cebex 100" expanding admixture by Messrs Fosroc UK Ltd in accordance with their instructions.

The water content in the pinning concrete is to be the minimum necessary to ensure hydration of the cement and the consistency should be such that the wetted mix will just bind under strong hand pressure.

Structural details and sections to be issued once exploratory works have been undertaken

Numbers in bay refer to a "possible" excavation and underpinning sequence to be undertaken by the contractor

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Title
Foundation Plan

Project
4 Langland Gardens, NW3 5PB
Client
Zen Developments

Job No.	Drawing No.	Revision
2385	100	(P1)

ISSUED FOR COMMENT 1:50 @ A1

A1

DO NOT SCALE FROM THIS DRAWING

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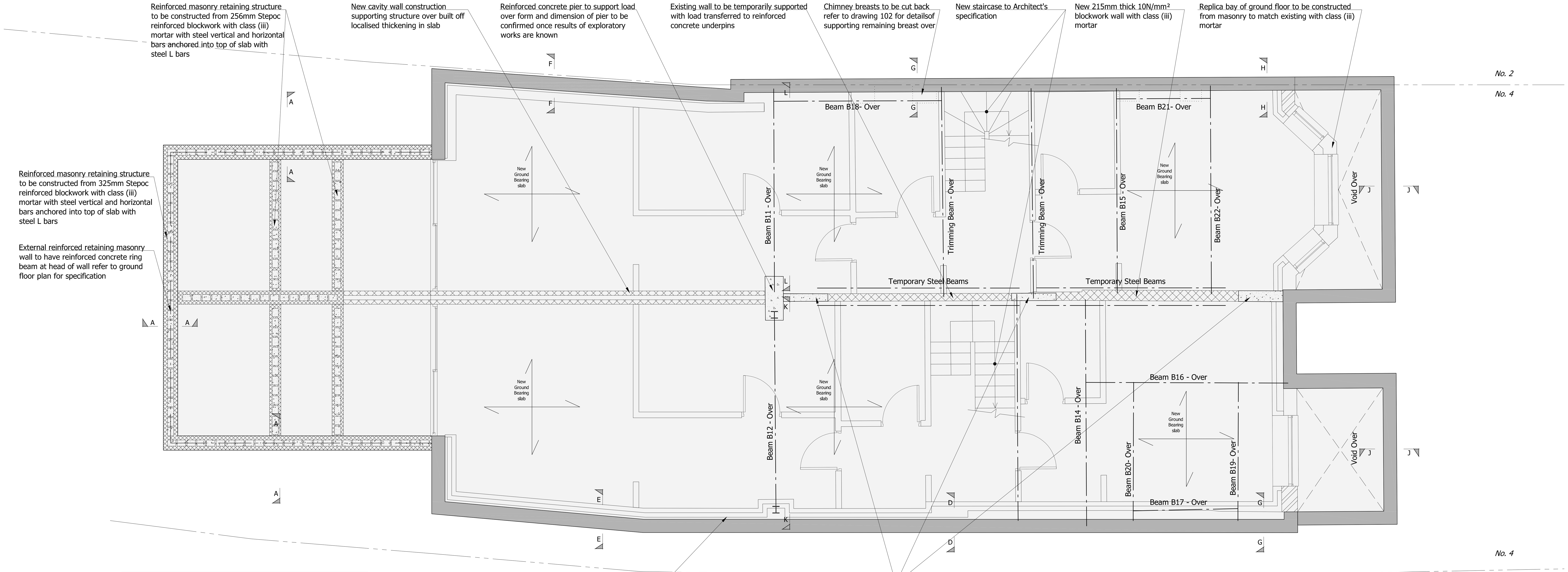
Drawing History

REV	DATE	DESCRIPTION	DRAWN	CHKD
P1	12.03.15	Issued for Comment	JG	JS



All cutouts to be cleanly disc cut. Beams to be tightly dry packed into position - See Specification

Non shaded walls indicate non load bearing walls to be constructed from C16 grade timber studs to Architect's dimensions

30x5mm mild steel restraint staps to be installed at 1200mm centres, 1200mm long at all junctions between the floor plates and steelwork/masonry

Where steelwork is supporting masonry/blockwork, gap between top flange of beam and structure over to be tightly dry packed into position. Minimum gap to be 25mm. Temporary works only to be removed once dry pack has hardened

Unless specified otherwise standard steelwork connection to be via 10mm thick endplate with 6mm thick full face fillet weld with 4no M16 bolts into adjoining steel

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Title
Basement Plan

Project
4 Langland Gardens, NW3 5PB

Client
Zen Developments

Job No.	Drawing No.	Revision
2385	-101	(P1)

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Drawing History

REV	DATE	DESCRIPTION	DRAWN	CHKD
P1	12.03.15	Issued for Comment	JG	JS

Reinforced concrete ring beam to be installed at head of wall formed from RC40 concrete with horizontal bars in both faces with shear links @ 200mm centres. Beam to be tied back to reinforced masonry wall with H16 L bars

New steps to Architect's specification

Structural details and sections to be issued once exploratory works have been undertaken

∗ denotes junction between new and old masonry walls use Ancon Staifix Universal wall starter kit.

Throughout external walls forming extension to be cavity construction subject to confirmation from Architect

New Cavity Walls:
Outer leaf: Brickwork to match existing with class (iii) mortar. Engineering bricks or F2 designation to be used below DPC
Inner leaf: 3.6N/mm2 blockwork with class (iii) mortar. Engineering bricks or F2 designation blockwork to be used under DPC

Lintel to support structure over to have a minimum 150mm bearing and tightly dry packed into position

Ground floor construction in main body shown retained subject to opening up works

New Floor construction throughout to be formed from 200x50mm C24 timber floor joists at 400mm centres with 18mm OSB/3 or ply sheeting over

Boxframe to provide lateral stability to this portion of the property

Dotted lines denotes walls to be demolished

Beam B18 to provide support to chimney breast and stack over, to be installed within the depth of new floor construction. B18 to have cleated connection into B11 and stair trimming beam

Existing wall clashes with new staircase at basement level

Padstone Schedule:
P1: 450x100x200mm thick mass concrete padstone
P2: 450x100x200mm thick mass concrete padstone
P3: 450x100x200mm thick mass concrete padstone
P4: 450x100x200mm thick mass concrete padstone
P5: 450x100x200mm thick mass concrete padstone
P6: 450x100x200mm thick mass concrete padstone
P7: 450x100x200mm thick mass concrete padstone
P8: 300x200x200mm thick mass concrete padstone
P9: 450x100x200mm thick mass concrete padstone
P10: 300x200x200mm thick mass concrete padstone.
All padstones to be tightly dry packed into position.

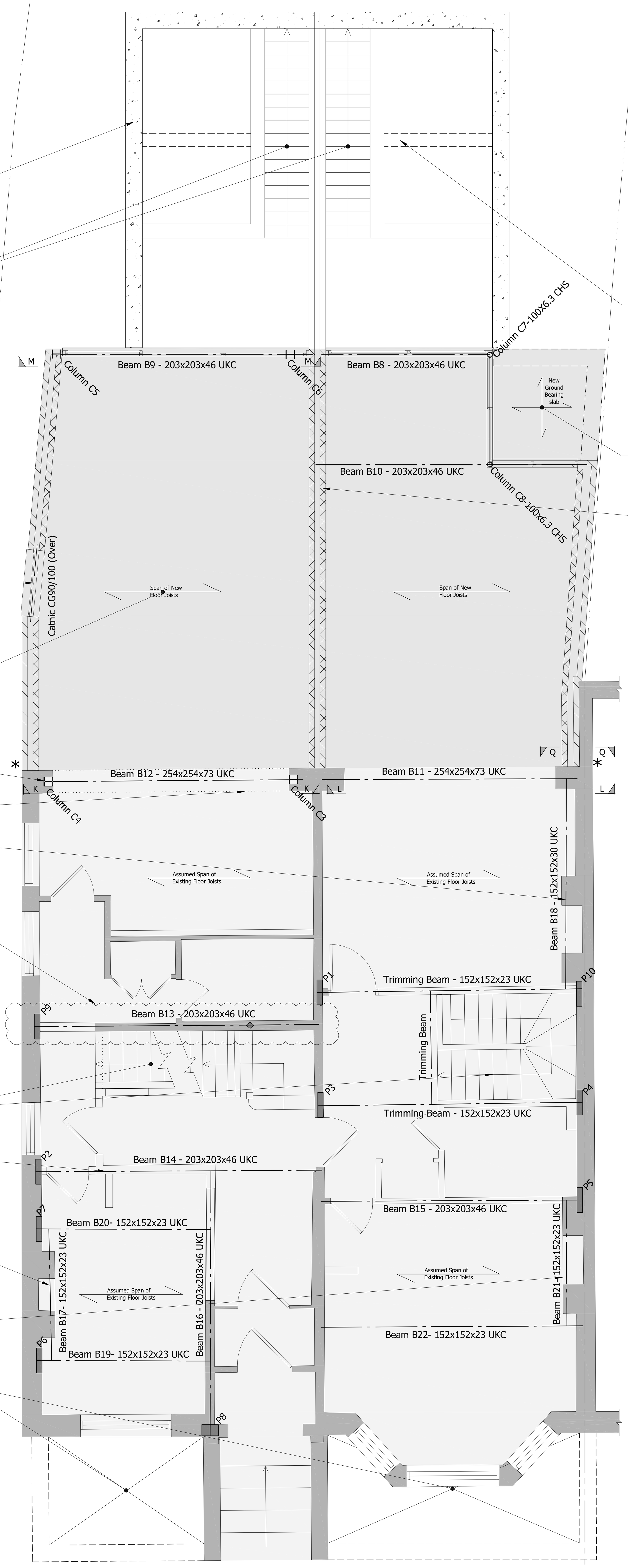
New staircase to Architect's specification

Beams to be installed under existing walls to enable mass excavation and underpinning to lower ground. Gap between top of beams and masony to be tighlty dry packed. Where walls are timber folded wedges to be used to ensure load transfer

Beam B17 to provide support to chimney breast and stack over, to be installed within the depth of new floor construction. B17 to bear onto front facade a minimum 100mm and to have a cleated connection into B14

Beam B21 to provide support to chimney breast and stack over, to be installed within the depth of new floor construction. B21 to have cleated connection into B15 and B22

Lightwell and grill to Architect's specification



Landscape consultant to advise Blue Engineering of any design considerations

New 150mm thick suspended slab with A393 mesh in the middle. Architect to confirm build up

New 300mm thick cavity wall both leaves to be 3.6N/mm2 blockwork with class (iii) mortar. Engineering bricks or F2 designation blockwork to be used under DPC

Ground Floor Plan
Scale 1:50

Structural details and sections to be issued once exploratory works have been undertaken

Beams B4-B7 to have 8mm thick steel plates welded to bottom flange to support outer leaf

Privacy screen to be able to resist residential balustrade loading to specialist's design to be positively fixed down to structure under

New roof construction to be formed from 150x50mm C24 timber joists at 400mm centres with 18mm OSB/3 or ply sheeting over glued and screwed

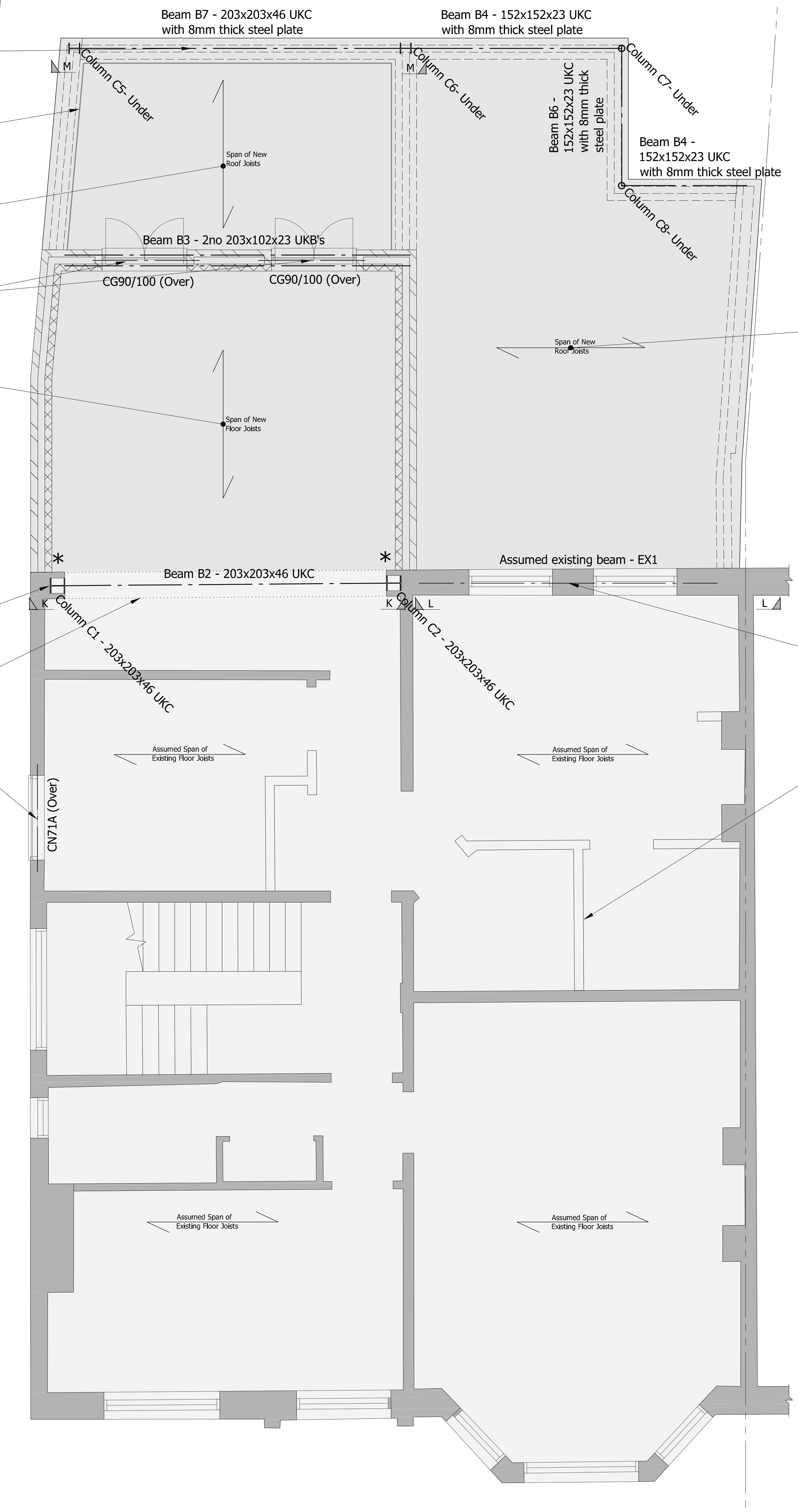
Catnic lintels over opening to be CG90/100 based on 100mm cavity Architect to confirm. Lintels to have 150mm bearing and tightly dry packed into position

New floor construction to be formed from 225x50mm C24 timber floor joists at 400mm centres with 18mm OSB/3 or ply sheeting over glued and screwed

Boxframe to provide lateral stability to this portion of the property

Wall to be cleanly disk cut back to create opening into extension

New opening to be supported by Catcnic CN71A with 150mm bearing into masonry and tightly dry packed into positon



First Floor Plan
Scale 1:50

All cutouts to be cleanly disc cut. Beams to be tightly dry packed into position - See Specification.

30x5mm mild steel restraint straps to be installed at 1200mm centres, 1200mm long at all junctions between the floor plates and steelwork/masonry.

Non shaded walls indicate non load bearing walls to be constructed from C16 grade timber studs to Architect's dimensions

All remaining existing joists to be inspected for general condition, rot and decay

Where twin beams have been specified beams to be bolted together with M16 bolts and spacer tubes @ 250mm centres staggered

All bolts to be grade 8.8 unless specified otherwise

Where steelwork is supporting masonry/blockwork, gap between top flange of beam and structure over to be tightly dry packed into position. Minimum gap to be 25mm. Temporary works only to be removed once dry pack has hardened

Unless specified otherwise welds to be 6mm thick full face fillets

Unless specified otherwise standard steelwork connection to be via 10mm thick endplate with 6mm thick full face fillet weld with 4no M16 bolts into adjoining steel

Sliding doors under beam assumed to be top hung with deflection limited to span/325. Manufacturer to confirm this is acceptable

New roof construction to be formed from 200x50mm C24 timber joists at 400mm centres with 18mm OSB/3 or ply sheeting over glued and screwed

∗ denotes junction between new and old masonry walls use Ancon Staifix Universal wall starter kit.

Throughout external walls forming extension to be cavity construction subject to confirmation from Architect

New Cavity Walls:
Outer leaf: Brickwork to match existing with class (iii) mortar. Engineering bricks or F2 designation to be used below DPC
Inner leaf: 3.6N/mm2 blockwork with class (iii) mortar. Engineering bricks or F2 designation blockwork to be used under DPC

Contractor to undertake opening up works to confirm form and condition of existing beam EX1

New non structural walls where parallel to joists, joists to be locally doubled up

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Title
Ground and First Floor Plan

Project
4 Langland Gardens, NW3 5PB
Client
Zen Developments

Job No.	Drawing No.	Revision
2385	102	(P1)

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A1

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Drawing History

REV	DATE	DESCRIPTION	DRAWN	CHKD
P1	12.03.15	Issued for Comment	JG	JS

Structural details and sections to be issued once exploratory works have been undertaken

New roof joists to be 200x50mm C24 timbers at 400mm centres with 18mm WBP ply sheeting or OSB/3 to one face

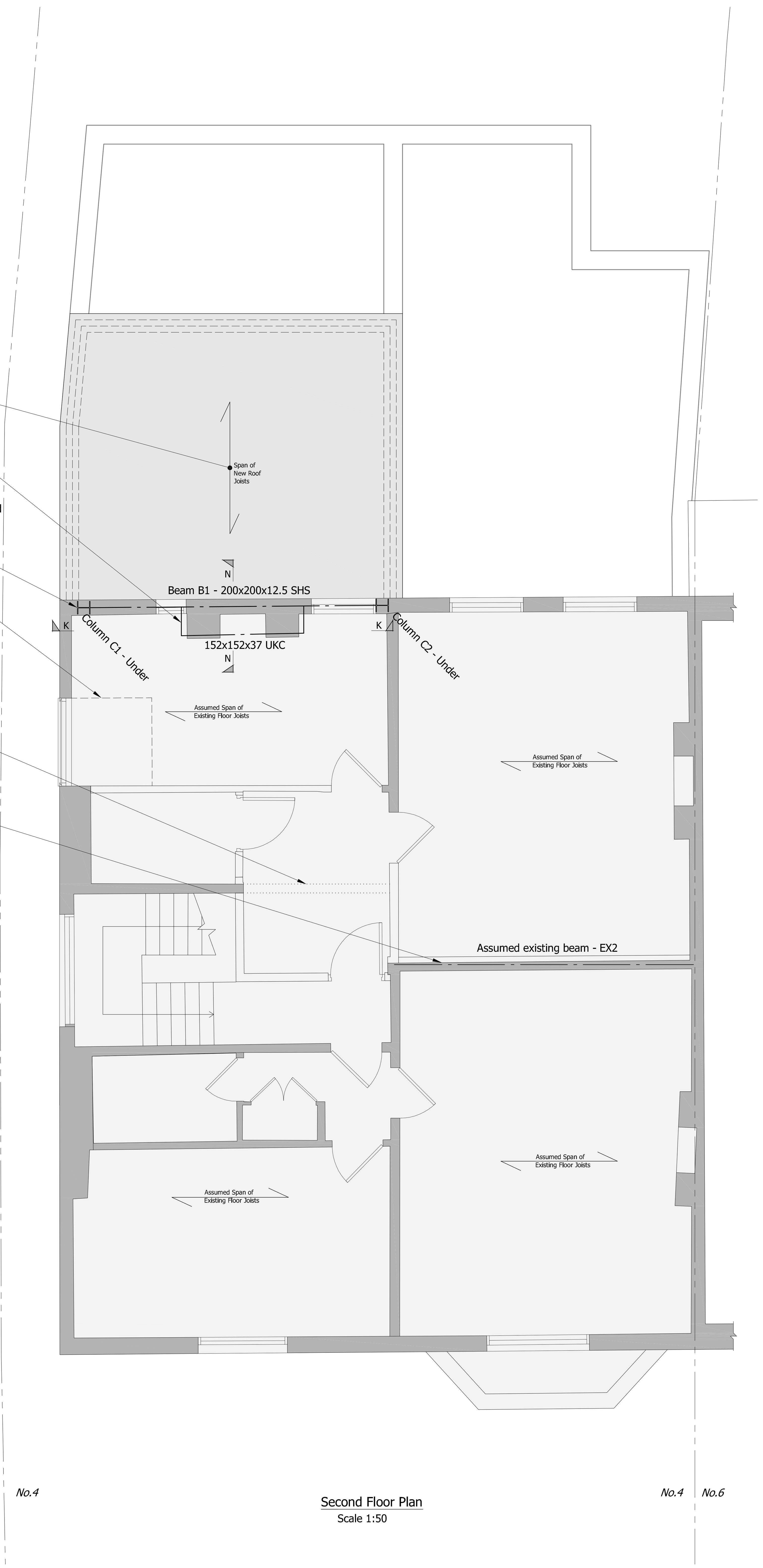
Remaining chimney breast and stack over to be supported by new 152x152x37 UKC cantilevering steel beams. Gap between top of steels and masonry to be tightly dry packed

Boxframe to provide lateral stability to this portion of the property

Dashed line denotes outline of new dormer over. Refer to roof plan for structural requirements

Assumed non load bearing wall to be demolished opening up works to confirm

Site inspection identified masonry wall with timber stud wall under. Opening up works to confirm existing structure



Second Floor Plan
Scale 1:50

Structural details and sections to be issued once exploratory works have been undertaken

Dormer to be constructed off doubled up rafters grade C24 bolted together with M12 bolts and double sided tooth connectors @ 250mm centres

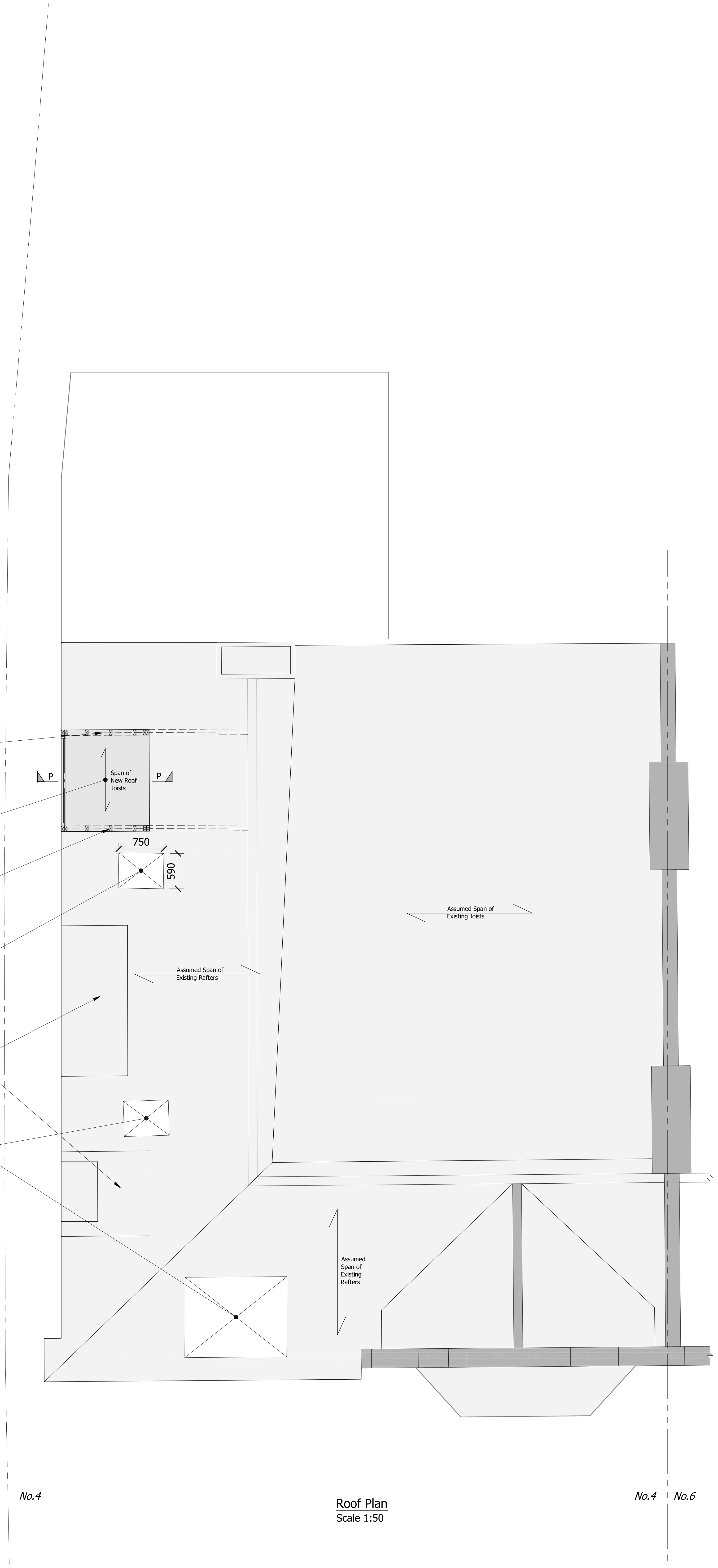
New dormer roof construction to be 100x50mm C24's @ 400mm centres with 18mm ply to one face

Side facade of dormer to be formed from 100x50mm C16 studs @ 400mm centres doubled up at openings with 18mm ply to outer face

Openings in new pitched roof to be created by doubling up rafters and introducing 150x50mm C24 timber trimmers.- Openings to be no larger than dimensioned

Existing chimney stack to be inspected for general condition. Contractor to notify Blue Engineering if in poor condition contractor to allow for re-building stacks

Existing rooflight to be retained subject to confirmation from Architect



Roof Plan
Scale 1:50

All cutouts to be cleanly disc cut. Beams to be tightly dry packed into position - See Specification

Non shaded walls indicate non load bearing walls to be constructed from C16 grade timber studs to Architects dimensions

30x5mm mild steel restraint staps to be installed at 1200mm centres, 1200mm long at all junctions between the floor plates and steelwork/masonry

All remaining existing joists to be inspected for general condition, rot and decay

All bolts to be grade 8.8 unless specified otherwise

Doubled and trebled timbers to be bolted together with M12 bolts and double sided toothed connectors

Unless specified otherwise all welds to be 6mm thick full face fillet welds

Where steelwork is supporting existing masonry, gap between bottom of masonry and top of steelwork to be tightly dry packed into position.

Refer to Architect's drawings for fire protection Specification

Unless specified otherwise standard steelwork connection to be via 10mm thick endplate with 6mm thick full face fillet weld with 4no M16 bolts into adjoining steel

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Title
Second Floor and Roof Plan

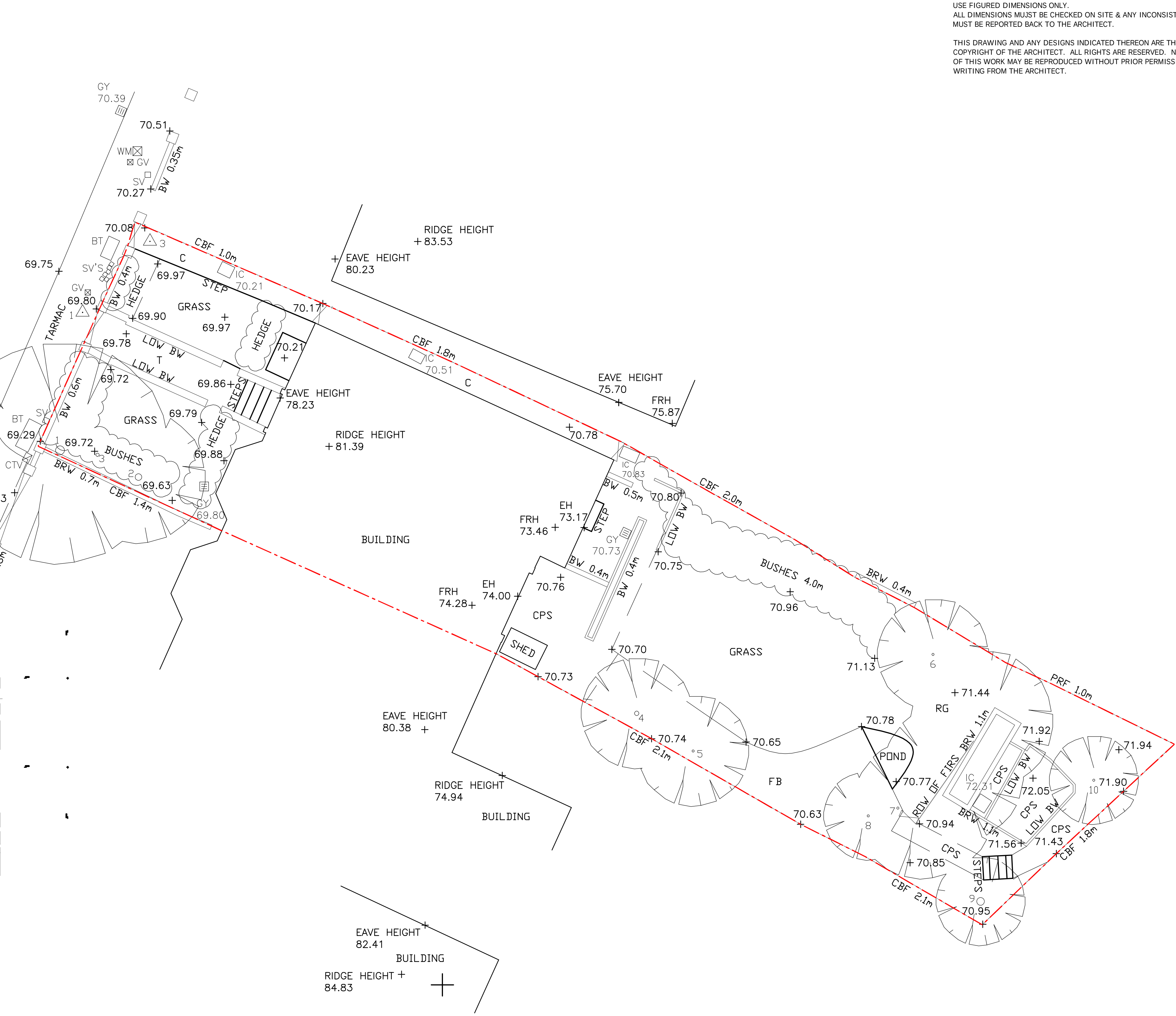
Project
4 Langland Gardens, NW3 5PB

Client
Zen Developments

Job No.	Drawing No.	Revision
2385	-103	(P1)

ISSUED FOR COMMENT 1:50 @ A1

A1



1 SITE LOCATION PLAN
1 : 2500

2 EXISTING SITE PLAN
1 : 200

Bchitecture
11A Beresford Road London N2 8AT

LOCATION
4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE
SITE LOCATION PLAN & EXISTING SITE PLAN

DATE
Dec 2014

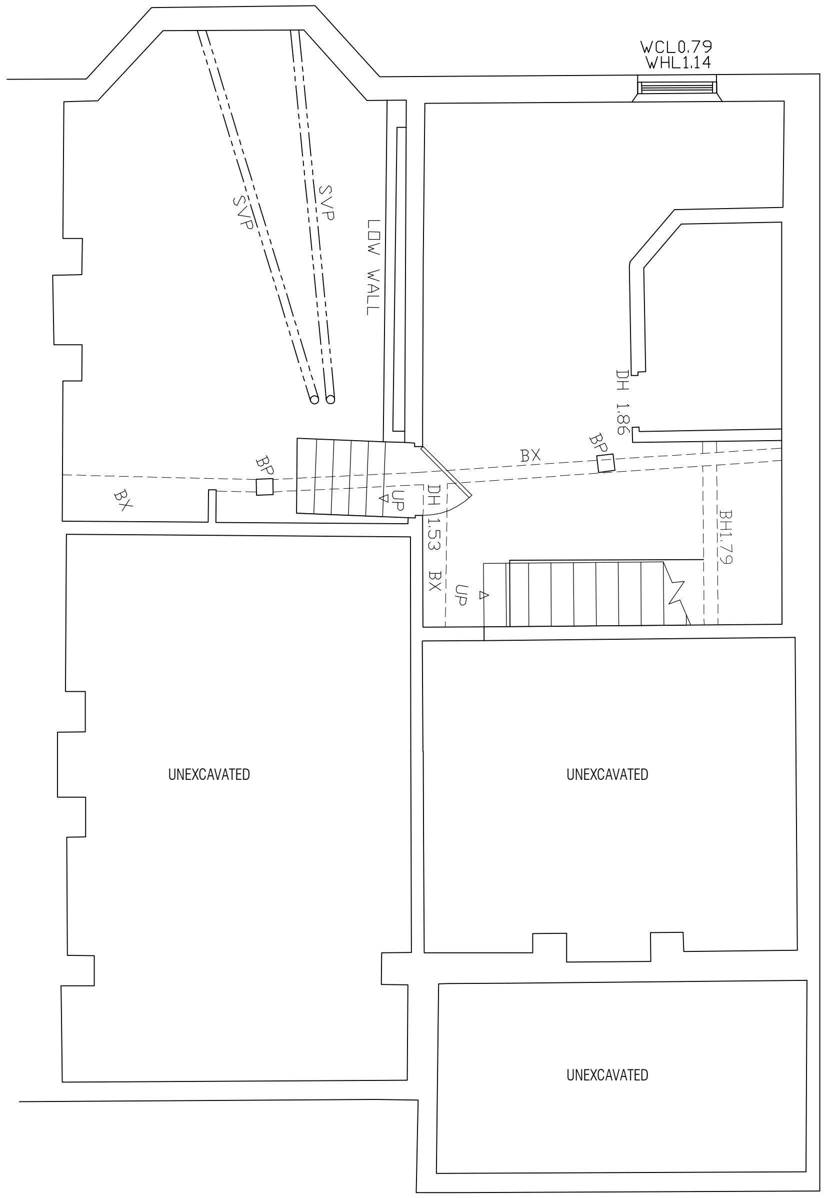
SCALE
1:2500
1:200
@A3

JOB NO
1410

DWG NO/REV
100/-

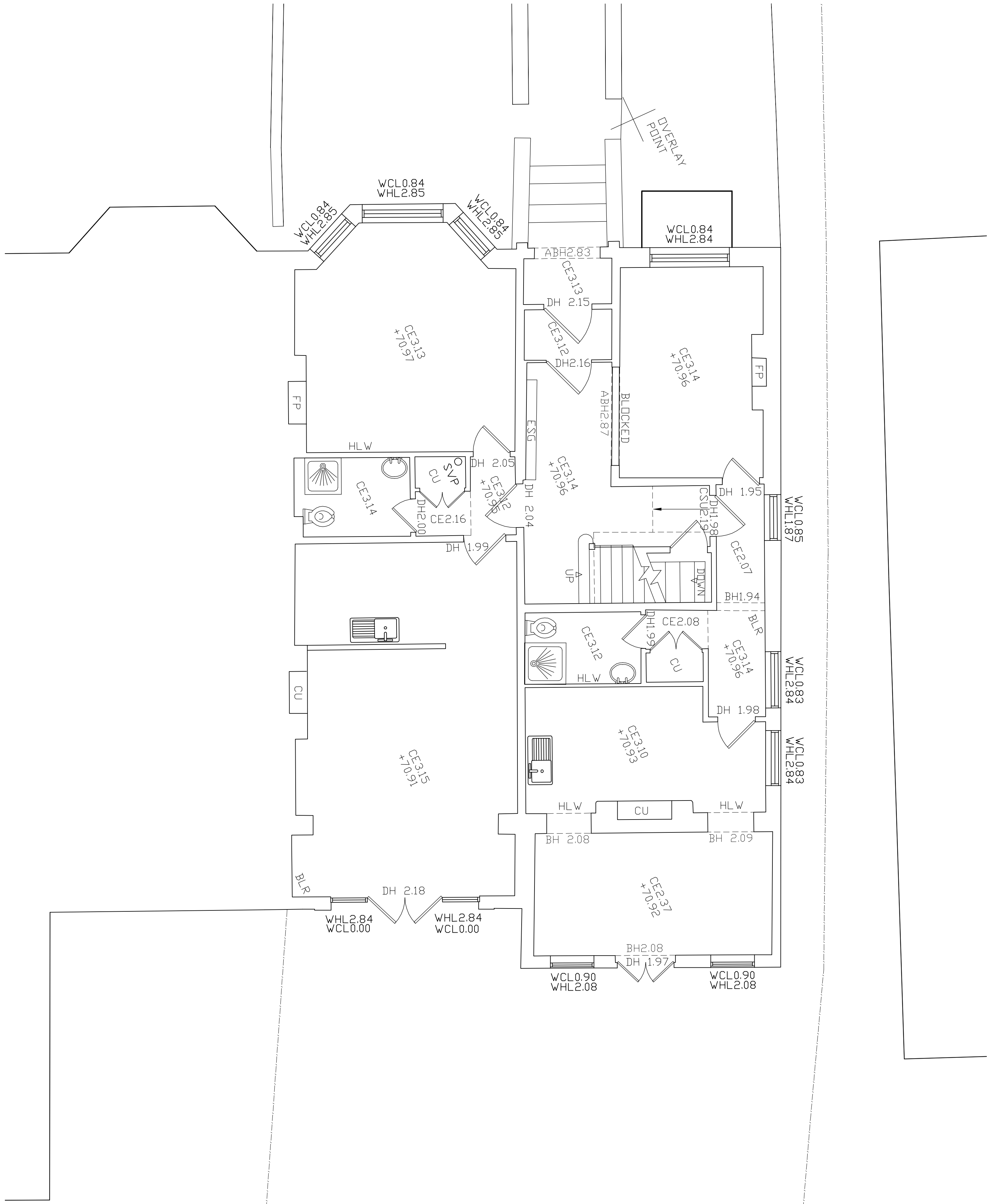
USE FIGURED DIMENSIONS ONLY.

ALL DIMENSIONS MUJST BE CHECKED ON SITE & ANY INCONSISTENCIES MUST BE REPORTED BACK TO THE ARCHITECT.



1 EXISTING BASEMENT FLOOR PLAN

1 : 100



2 EXISTING GROUND FLOOR PLAN

1 : 100

0 1 2 5

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11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE

EXISTING BASEMENT &
GROUND FLOOR PLANS

DATE

Dec 2014

SCALE

1:100
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JOB NO

1410

DWG NO/REV

101/B

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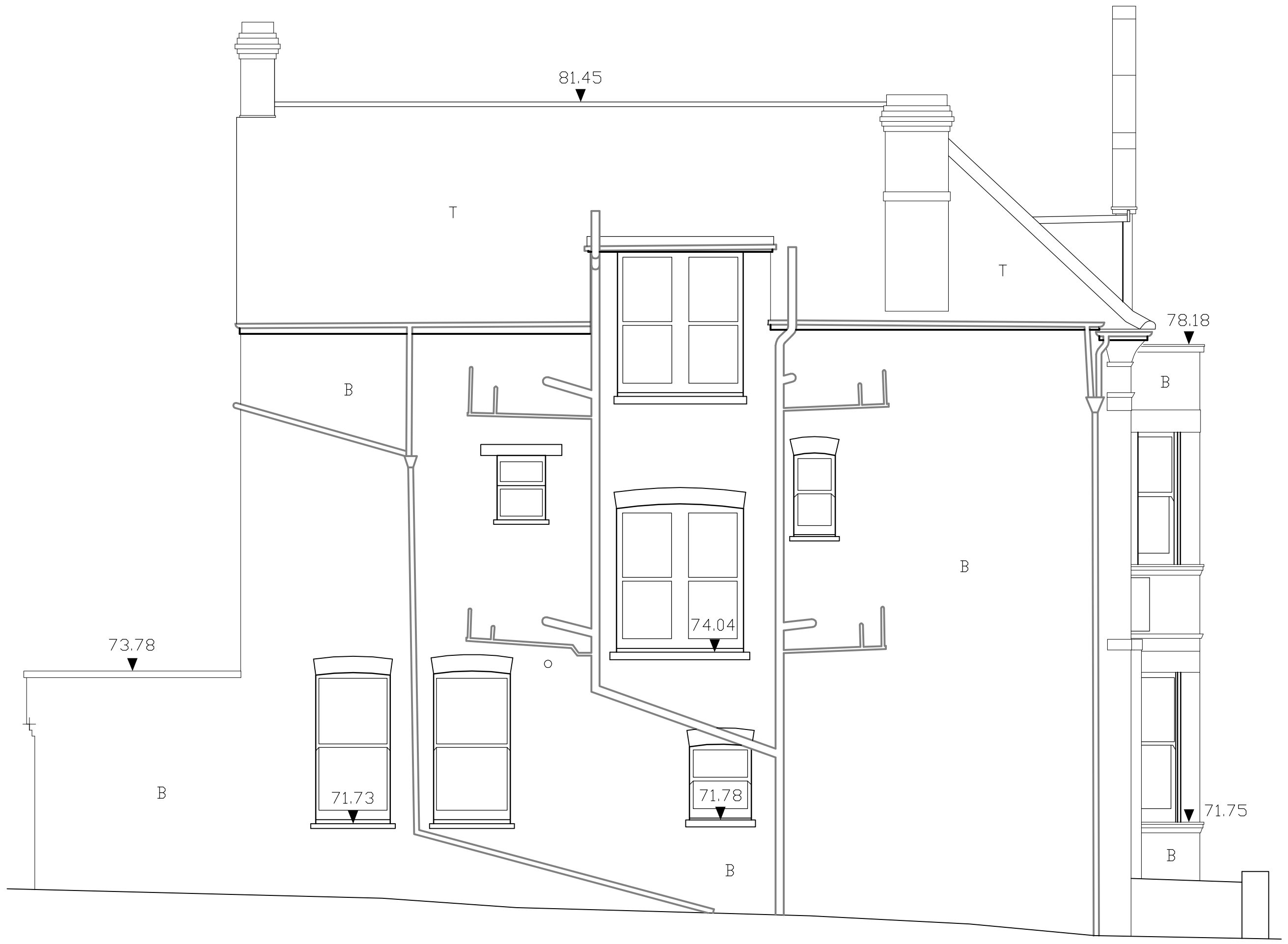
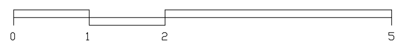


1 EXISTING SIDE ELEVATION
1 : 100

2 EXISTING FRONT ELEVATION
1 : 100



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LOCATION

4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE

EXISTING SIDE & FRONT
ELEVATION

DATE

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1410

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103/-

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ALL DIMENSIONS MUST BE CHECKED ON SITE & ANY INCONSISTENCIES MUST BE REPORTED BACK TO THE ARCHITECT.

1 EXISTING REAR ELEVATION

1 : 100

0 1 2 5

Bchitecture
11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE

EXISTING REAR ELEVATION

DATE

Dec 2014

SCALE

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1410

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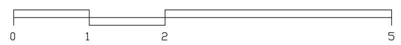
104/-

1 EXISTING LONG SECTION

1 : 100



Bchitecture

11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens Hampstead NW3 5PB

DRAWING TITLE

EXISTING LONG SECTION

DATE

Dec 2014

SCALE

1:100 @A3

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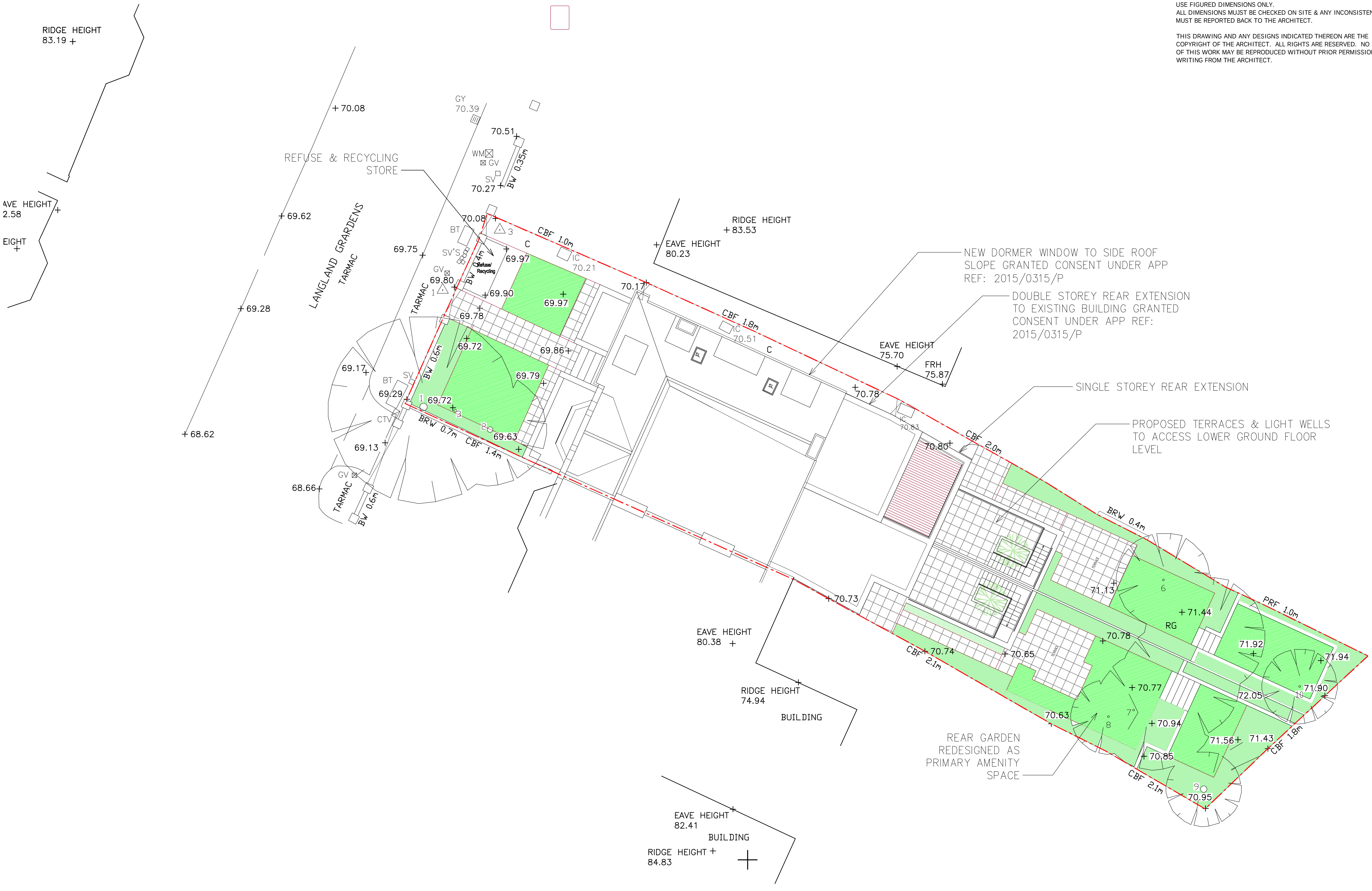
112/B



2 PROPOSED SITE PLAN
1 : 200

B chitecture
11A Beresford Road London N2 8AT

LOCATION
4 Langland Gardens
Hampstead NW3 5PB

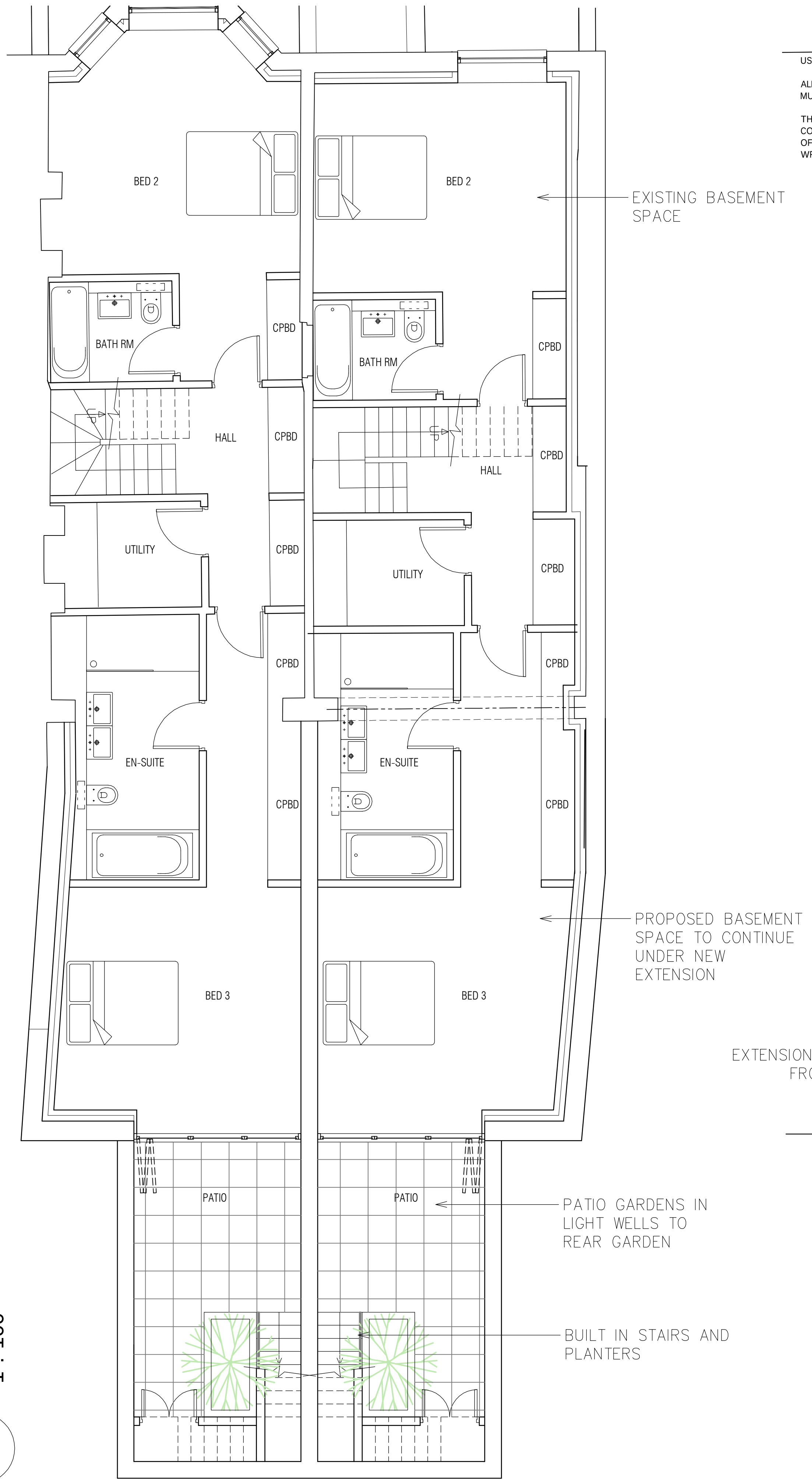
DRAWING TITLE
PROPOSED SITE PLAN

DATE
Dec 2014

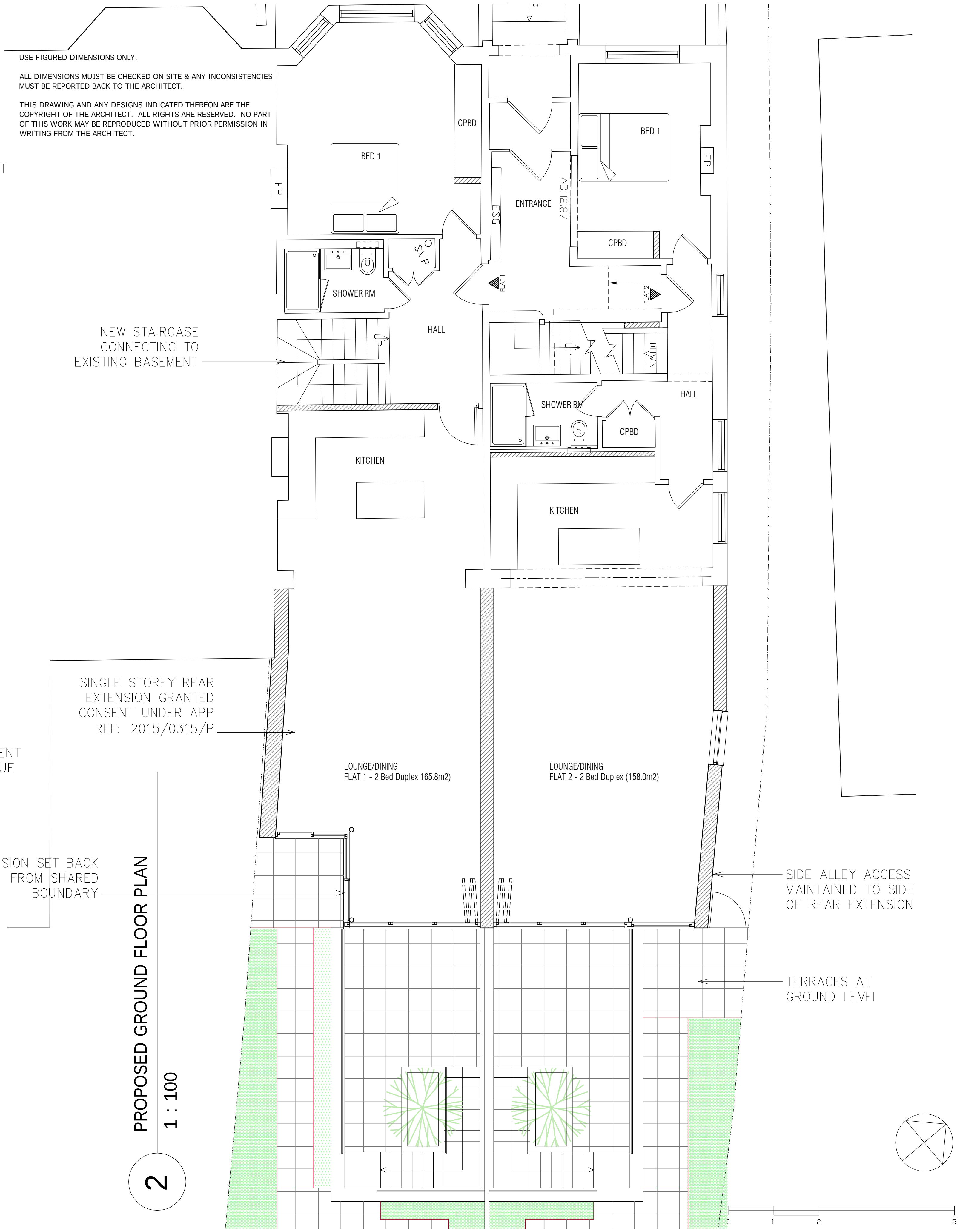
SCALE
1:200 @A3

JOB NO
1410

DWG NO/REV
205/E



1 PROPOSED BASEMENT FLOOR PLAN 1 : 100



2 PROPOSED GROUND FLOOR PLAN 1 : 100

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ALL DIMENSIONS MUST BE CHECKED ON SITE & ANY INCONSISTENCIES MUST BE REPORTED BACK TO THE ARCHITECT.

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11A Beresford Road London N2 8AT

LOCATION
4 Langland Gardens Hampstead NW3 5PB

DRAWING TITLE
PROPOSED BASEMENT & GROUND FLOOR PLANS

DATE
Dec 2014

SCALE
1:100 @A3

JOB NO
1410

DWG NO/REV
206/E

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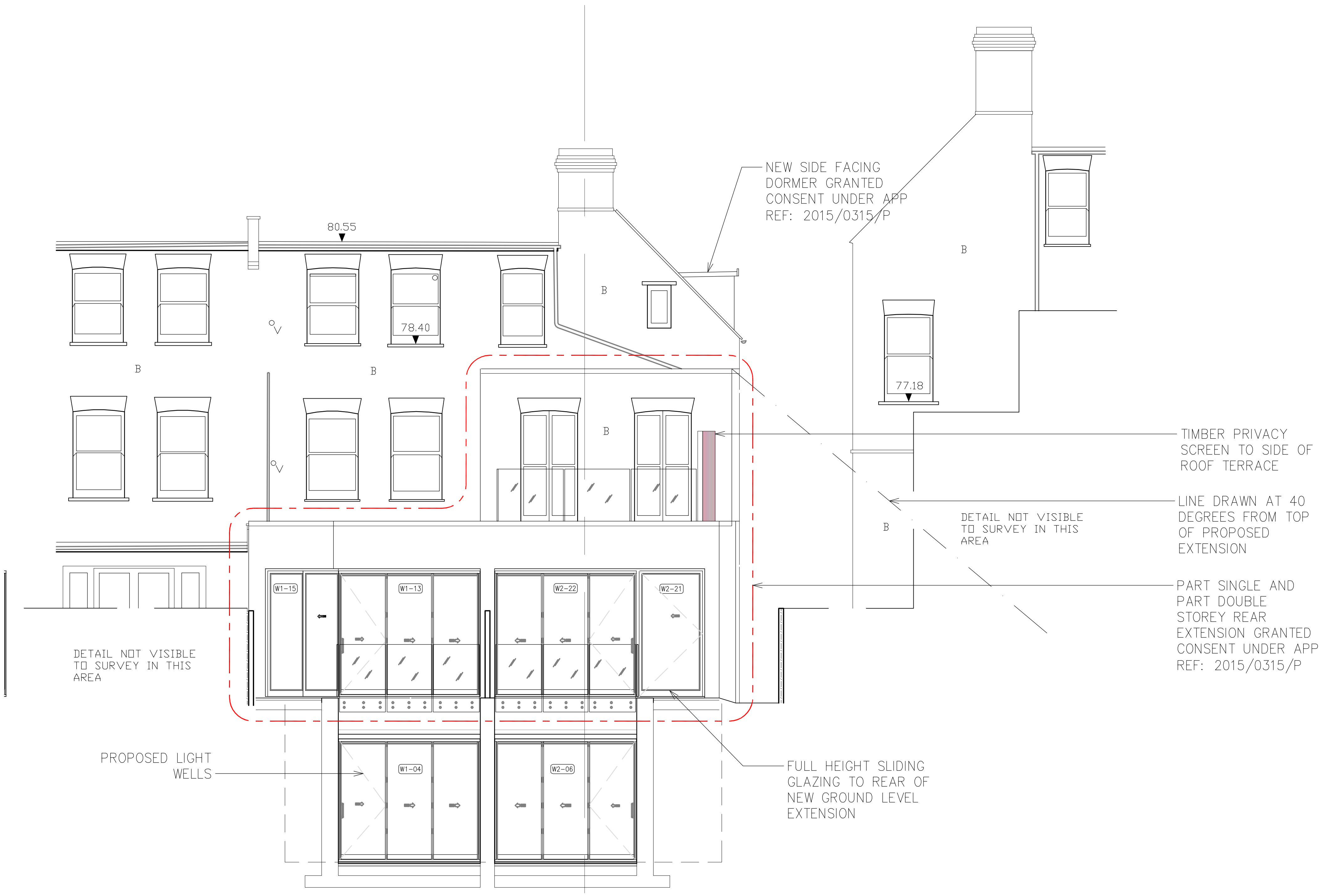

1 PROPOSED REAR ELEVATION

1 : 100

0 1 2 5

Bchitecture
11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE

PROPOSED REAR ELEVATION

DATE

Dec 2014

SCALE

1:100 @A3

JOB NO

1410

DWG NO/REV

210/D

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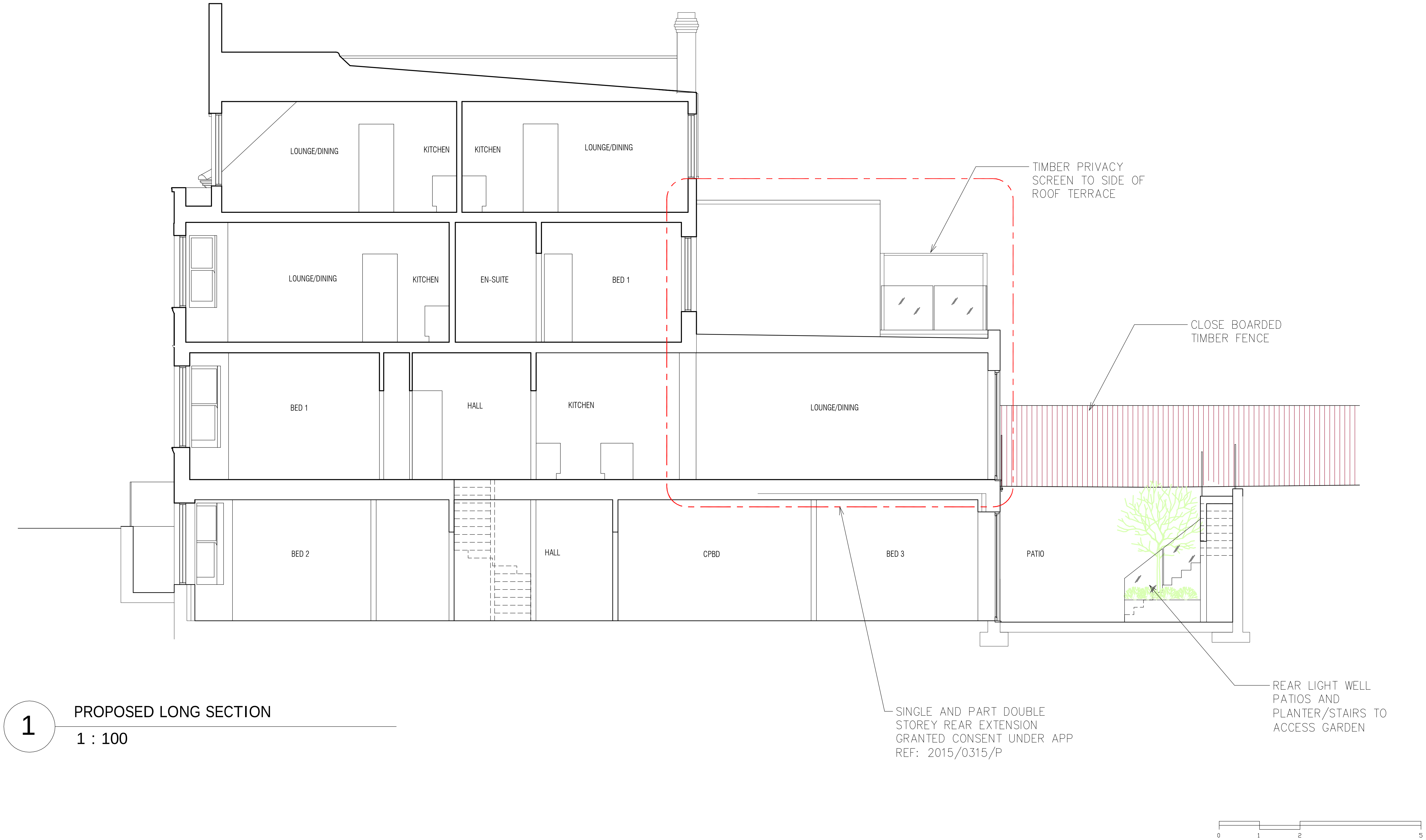


1 PROPOSED LONG SECTION

1 : 100

Bchitecture
11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens
Hampstead NW3 5PB

DRAWING TITLE

PROPOSED LONG SECTION

DATE

May 2015

SCALE

1:100 @A3

JOB NO

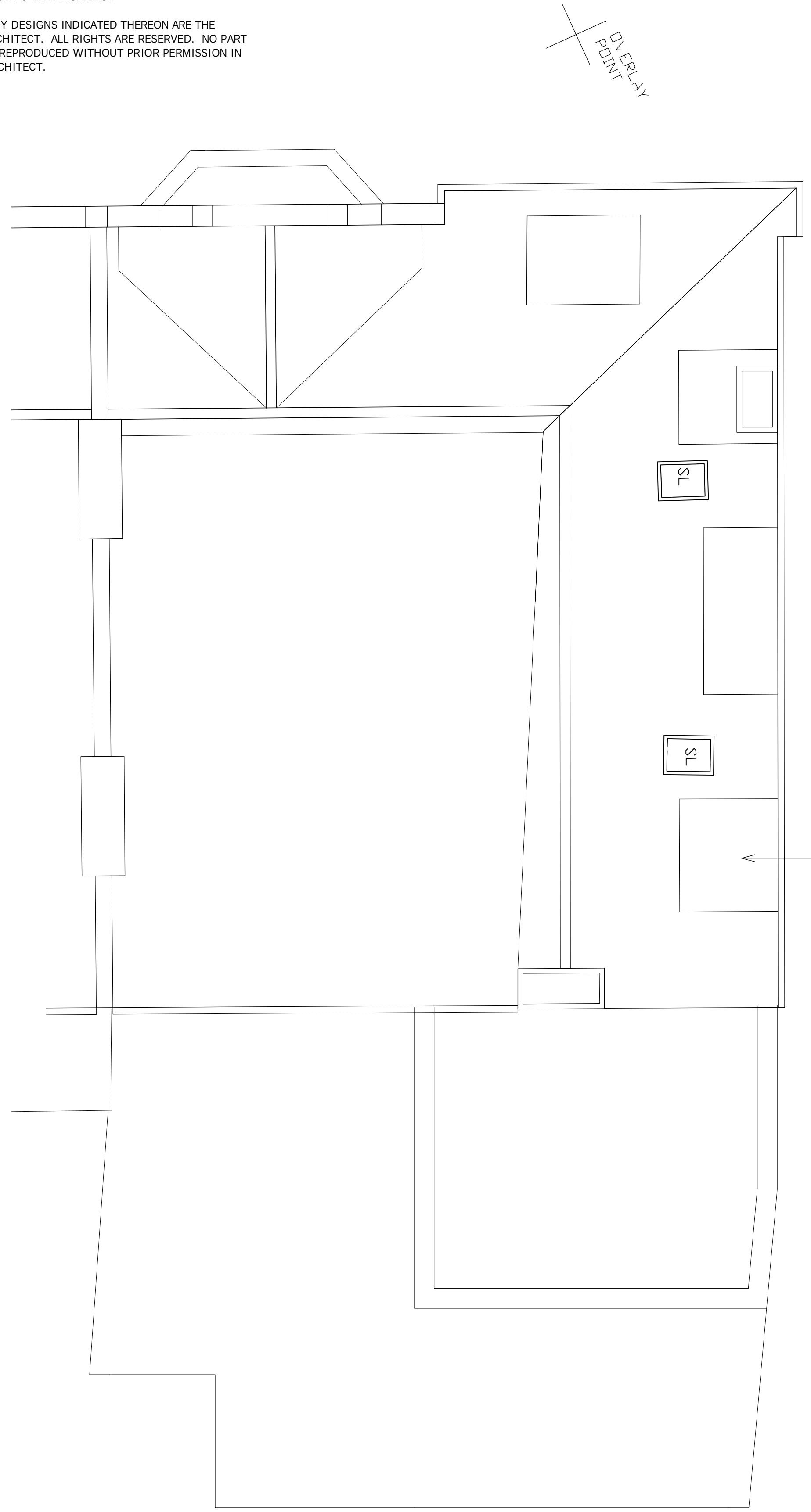
1410

DWG NO/REV

211/E

USE FIGURED DIMENSIONS ONLY.

ALL DIMENSIONS MUJST BE CHECKED ON SITE & ANY INCONSISTENCIES MUST BE REPORTED BACK TO THE ARCHITECT.



1 PROPOSED ROOF PLAN

1 : 100

2 PROPOSED FRONT ELEVATION

1 : 100

Bchitecture
11A Beresford Road London N2 8AT

LOCATION

4 Langland Gardens Hampstead NW3 5PB

DRAWING TITLE

PROPOSED ROOF PLAN & FRONT ELEVATION

DATE

Dec 2014

SCALE

1:100 @A3

JOB NO

1410

DWG NO/REV

208/A

Statement of experience on basements

Soiltechnics have carried out a large number of investigations for basement constructions throughout the UK and in more recent years outside the UK

The following table provides a limited number examples (for illustration purposes) of investigations carried out for basements which include interpretative reports providing parameters for detailed design such as settlement / heave, ground movements around basements, hydrological effects and in some cases preliminary design of piles.

Location	ground conditions	Basement	Approx size (m)	Date
Northamptonshire	Glacial Till	Single storey archive store for Rolls Royce. Part open excavation for construction of reinforced concrete box subsequently backfilled	10 x 8	Circa 1992
Central London (Kings Road)	Terrace sands and gravels over London Clays	Two storey deep car park with gardens at ground level. Contiguous pile wall with subsequent insitu concrete box	40 x 20	Circa 2000
Central London (Finsbury square)	Terrace sands and gravels over London Clays	Two storey deep basement below multi storey building with adjacent buildings. Contiguous pile wall with subsequent insitu concrete box	30 x 20	Circa 2002
Central London (Union Street)	Terrace sands and gravels over London Clays	Two storey deep basement below multi storey building with adjacent buildings including tube tunnels. Contiguous pile wall with subsequent insitu concrete box	40 x 30	2009
Central London (Blackfriars)	Terrace sands and gravels over London Clays	Two storey deep basement below multi storey building with adjacent buildings including railway viaduct . Contiguous pile wall with subsequent insitu concrete box	40 x 20	2005
Central London (Imperial College)	Terrace sands and gravels over London Clays	Single storey deep basement below multi storey residential block. Sheet pile walls with subsequent insitu concrete box	60 x15	2005
Coventry University	Mercia Mudstones	Single storey deep basement with three storey building over. Part cut and part sheet piled with subsequent insitu concrete box	50 x50	2010
Rabat Grand theatre Bouregrerg Morrocco	Alluvial gravels over sandstone	Single storey deep basement. Open excavations and sheet piles walls with subsequent insitu concrete box. Piled foundation for super structure. Area subject to earthquakes and liquefaction. Outline design of piles, specification for piling and testing.	50 x50	2012
Central London (various locations)	London Clays occasionally overlain with terrace sands and gravels	Various existing terraced semi and detached domestic properties. New single and two storey deep basements under building foot prints and extending into gardens. Construction using traditional underpinning techniques and contiguous / secant piled walls	Various	2000 to date
Central London (Holland Park)	London Clays	Two locally three storey deep basement below new four storey block of flats. Secant piled walls and insitu concrete box	70 x 20	2014

Curriculam Vitae
Nigel Thornton
B.Sc, C.Eng, MICE, MCIHT, FGS.

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Qualifications

- Awarded degree in Civil Engineering., City University, London in 1980
- Elected Member of the Institution of Civil Engineers in 1983 (Chartered Civil Engineer)
- Member of the Chartered Institution of Highways and Transportation since 1984
- Fellow of the Geological Society since 1986

Employment History

• Northampton Borough Council	1975 - 1980
• Northamptonshire County Council	1980 - 1989
• The John Parkhouse Partnership	1989 - 1989
• Associate Partner	1989 - 1993
• Partner	1993 - 2005
• JPP Consulting (Director)	2005 to date
• Soiltechnics (Director)	1993 to date

Note

- In 2005, the John Parkhouse Partnership was incorporated into JPP Consulting Ltd (current complement 28 staff)
- Founding Director of Soiltechnics Ltd, a company specialising in geotechnical and geo-environmental matters. (Current complement 27 staff)

Relevant Experience

Bridgeworks	General design, contract administration and site supervision of various highway bridges and retaining structures.
Geotechnical and Geo-environmental	As Geotechnical Project Manager for Engineering Services Laboratory at NCC (ESL). (1985 - 1989) Control of ground investigations for major highway schemes for local authority including implementation of fieldwork, direction of laboratory testing and production of factual and interpretative reports, following and satisfying geotechnical certification procedures for Department of Transport (schemes up to £15m) Generally, at ESL, Soiltechnics and JPP. Design and specification of earthworks, including determination of slope stability. Investigation and remediation of unstable slopes. Control, implementation of fieldwork and production of geotechnical reports for industrial and commercial developments, housing schemes and water authority infrastructure (scheme values up to £80m). Investigations for outline designs of landfill sites. Investigations for redevelopment of chemically contaminated sites, assessment of the same, design and verification of remediation works. Production of tender and contract documents for ground investigations.

	Investigations into mine workings and assessment of their stability. Specifications for ground improvement works (vibrotreatment) and piling. Investigations and reporting on a wide range of basement constructions for commercial and residential buildings 1 to 4 stories deep. Producing basement impact reports. Lecturing to other professionals on the investigation assessment and remediation of contaminated land, and EPA part IIA Lectures to local ICE branch on geotechnical aspects.
Materials Management	Production of construction material specifications, primarily in concrete, aggregates and bituminous mixtures, but including masonry, timer, steel and protective systems. Control and implementation of investigations into failures of construction materials including scheduling and analysing test data, and production of technical reports providing specifications for appropriate remedial measures.
Building Structures	Structural inspections and surveys on a wide range of commercial, domestic, industrial and military buildings including direction of appropriate investigations and production of details repairs/construction specifications. Design and checking of building structures in timber, steel, concrete and masonry including supervision of works on site. Design works carried out both manually and using computerised systems following current British Standards and other recognised design standards.
Road Pavement Structures	Direction and implementation of condition surveys and investigations of road pavement using falling weight deflectometer, deflectograph bump integrator and coring. Direction of testing regimes for bituminous and cement bound and unbound pavement materials. Production of reports on condition and assessment of load carrying capacity of existing roadways and specification and structural design for new roadways for both highway and industrial use. Design of various road pavement structures (flexible and rigid) using Highways Agency guidelines and British Ports Federation guidelines.
Drainage and Flood Risk Assessments	Design of main (adoptable) and private foul and stormwater infrastructure for housing, commercial and industrial schemes, including detention basins, infiltration systems, pumping stations etc. Production of flood risk assessment reports.
Quality Assurance	Assisting in production of main laboratory procedures to obtain NAMAS accreditation for large spectrum of soils and materials testing. Geotechnical contributions to Quality Assurance Manual for Soiltechnics/JPP and implementation of procedures.
CPD and Health and Safety	Attendance of in house CPD Seminars and production of Health and Safety Plans/files for building works. Author of in house risk assessment and Practice policies.
Litigation	Acting as expert witness on numerous construction related matters.
Publications	Co-author of a book entitles 'Cracking and Building Movement' published by the Royal Institution of Chartered Surveyors, in late 2004.

Chord Environmental Ltd

Nigel Thornton
Soiltechnics Ltd
Cedar Barn
White Lodge
Walgrave
Northampton
NN6 9PY

Your Ref: 4 Langland Gardens
Our Ref: 1127/LJE210115

For the attention of: Nigel Thornton

21 January 2015

4 Langland Gardens BIA Review

Dear Nigel,

Further to our discussions and the instruction to proceed on behalf your client (Zen Developments) I have undertaken a review of the Basement Impact Assessment (BIA) prepared by Soiltechnics Ltd for the proposed basement development at 4 Langland Gardens.

I have reviewed the design of the proposed basement development, together with the information presented within the above documents, against the requirements of the Camden BIA guidance set out within DP27 and CPG4.

Chord Environmental specialise in the provision of hydrogeological services with extensive experience in the UK supporting both private and public sector clients. I am a geologist and hydrogeologist and have a BSc. in geology from the University of Bristol, a MSc. in hydrogeology from the University of East Anglia and am also a Chartered Geologist and fellow of the Geological Society. I am Managing Director at Chord Environmental and was previously a Technical Director with Paulex Environmental Consulting and managed Hyder Consulting (UK) Ltd's groundwater team.

I have been a hydrogeologist for 17 years. During that time I have advised on over 70 basement developments. Much of my career has been spent assessing the impact of development on the quality and quantity of groundwater resources. I have worked for both promoters and regulators of schemes and have acted as an expert witness for the Highways Agency and on BIA schemes.

Development proposal

I understand the proposed development comprises the extension of the existing ground floor and lower ground floor footprint into rear gardens by a distance of around 5m from the rear south facing elevation. Additionally, the existing lower ground floor levels will be lowered by about 0.7m and the completed lower ground floor will provide bedroom accommodation. The extended lower ground floor level will be approximately 3.2m below current garden levels.

The proposal includes the management of on-site storm water collection so as not to increase the rate of storm water discharge to surface water sewers off site.

Environmental Site Setting

The BIA screening assessment and site investigation interpretation has identified 4 Langland Gardens to be underlain by the Eocene London Clay as shown on the British Geological Survey 1:50,000 scale map (Sheet 256 – North London) to a depth of c.80m. The London Clay is classified as Unproductive Strata by the Environment Agency, strata with low permeability that have negligible significance for water supply or river base flow. The very low permeability of the London Clay results in very low rates of rainfall infiltration and correspondingly, very high rates of rainfall runoff.

The London Clay, together with the clays of the Lambeth Group, acts as an effectively impermeable confining layer over the Chalk which lies at a depth of over 100m beneath the site.

There are no surface water features within 500m of the site, however Figure 11 of the "Camden Geological, Hydrogeological and Hydrological Study", shows a headwater tributary of the former Westbourne watercourse to have run along the line of Langland Gardens just to the north of the site. The Westbourne is now culverted beneath West Hampstead and discharges to the Thames.

Langland Gardens does not lie within an area of flood risk as designated by the Environment Agency although it was not affected by the surface water flooding of the region during 1975 but not during 2003.

Surface Flow and Flooding Assessment

The BIA screening, scoping and risk assessments have followed the CPG4 guidance criteria and screening questions. The potential surface flow and flooding issue raised by the screening and scoping exercises have been appropriately addressed by Soiltechnics within the report and no areas of concern relating to the proposed development were identified.

Subterranean (Groundwater) Flow Screening Assessment

The BIA screening, scoping and risk assessments have followed the CPG4 guidance screening questions. I have commented on the answer to each question below.

- **Question 1a: Is the site located directly above an aquifer?**

  As the Site is mapped as being underlain by a significant thickness of London Clay, designated as Unproductive Strata by the Environment Agency, I agree it is not located above an aquifer. The geology of the areas is well understood and the published geological map is based on extensive borehole data.

- **Question 1b: Will the proposed basement extend beneath the water table surface?**

  No. The London Clay is not capable of transmitting groundwater but because it is predominantly clay, it does hold water. As such there is not generally a water table present within it. Monitoring boreholes drilled within the London Clay do slowly fill with groundwater over time; however there is little or no hydraulic continuity between boreholes due to the very low permeability of the clay and ability of the clay matrix to hold or adsorb water.

  Additionally, the proposed basement would only extend 0.7m beneath the existing lower ground floor levels and there are no problems associated with groundwater at the property.

- **Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?**

  No surface water features are present within 500m of the site although a former tributary of the Westbourne is shown to have flowed just to the north of the Site. This would have emanated from the permeable layers within the Bagshot Sands and Claygate Member which outcrop c.50m to the north. The London Clay is not capable of providing groundwater baseflow to watercourses and is classified Unproductive Strata. The proposed basement would therefore not act to prevent groundwater flow to any watercourses, wells or spring lines.

- **Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?**

  No. The Site is located c.1.4 km southwest, and down topographic gradient, of the Hampstead Heath ponds and therefore lies outside their hydrological catchment area.

- **Question 4: Will the proposed development result in a change in the proportion of hard surfaced / paved area?**

  The proposed basement development would result in a net increase in building footprint. In relation to the assessment of the proposed development on groundwater flow, the purpose of this question is to determine whether rainfall recharge will be reduced. However, the London Clay's low permeability results in a negligible rate of rainfall infiltration and a correspondingly high rainfall runoff rate, therefore the proposed basement would not have an impact on groundwater resources.

  The proposal would incorporate storm water storage to attenuate surface flows from the site and improve the current drainage condition.

- **Question 5: As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to ground (e.g. via soakaways and/or SUDS)?**

  No. The lowly permeable nature of the London Clay strata is unsuitable for receiving surface water discharge to ground due to extremely low infiltration rates. However the proposal includes the management of o- site storm water through collection so as not to increase the rate of storm water discharge to surface water sewers off site.

- **Question 6: Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than,**

the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?

I agree there are no mapped local groundwater dependent ponds or spring lines present within 100m of the Site. This is consistent with the geology and hydrogeology of the area.

Slope Stability Assessment

The BIA screening, scoping and risk assessments have followed the CPG4 guidance criteria and screening questions. The potential slope stability issues raised by the screening and scoping exercises have been appropriately addressed by Nigel Thornton (C.Eng) of Soiltechnics Ltd within the BIA report and no areas of concern relating to the proposed development were identified.

Conclusions

The BIA report has appropriately characterised 4 Langland Gardens with respect to its geological and groundwater site setting. As the site is underlain by low permeability London Clay, the geological and hydrogeological setting of 4 Langland Gardens is not sensitive with respect to groundwater resources or flow.

The purpose of the Basement Impact subterranean or groundwater flow assessments is to identify the potential for the proposed development to cause groundwater impacts and subsequently identify areas which require further investigation. The proposed development would be sited within a significant thickness of London Clay and no potential adverse impacts have been established by these assessments and subsequent impact assessment.

Yours sincerely,

John Evans BSc MSc CGeol.

Director

THE GEOLOGICAL SOCIETY CGeol CHARTERED GEOLOGIST

Fellow No. 1012979

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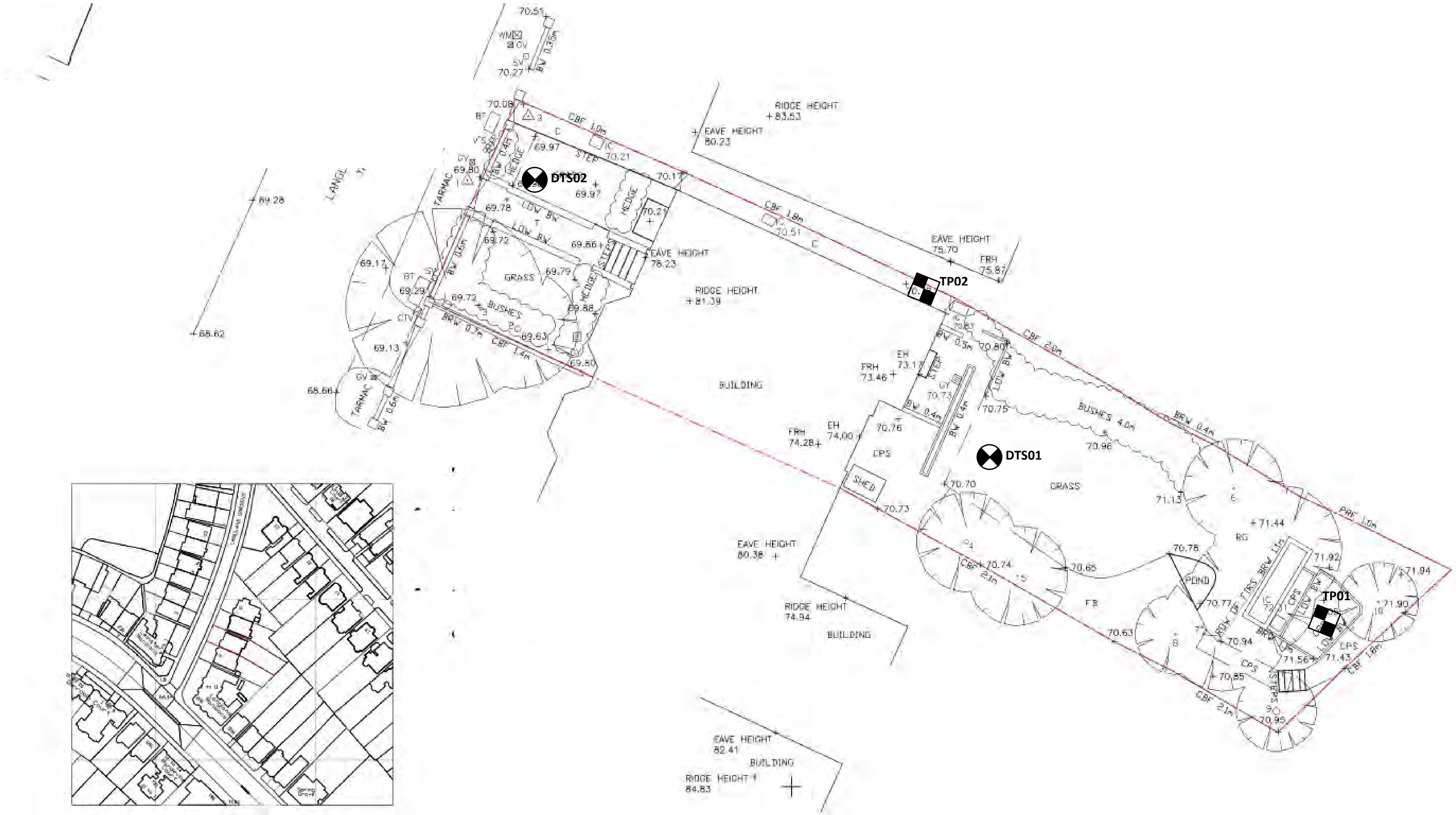

Key

(borehole symbol)	DTS01	Approximate location of borehole formed by Driven Tube Sampling techniques
(trial pit symbol)	TP01	Approximate location of trial pit excavation

Title	Scale	Drawing number
Plan showing existing site features and location of exploratory positions	Not to scale	01

Key to legends

Composite materials, soils and lithology

Topsoil	Made Ground	Boulders
Chalk	Clay	Coal
Cobbles	Cobbles & Boulders	Concrete
Gravel	Limestone	Mudstone
Peat	Sand	Sand and Gravel
Sandstone	Silt	Silt / Clay
		Siltstone

Note: Composite soil types are signified by combined symbols.

Key to 'test results' and 'sampling' columns

Test result	
Depth	Records depth that the test was carried out *(i.e.: at 2.10m or between 2.10m and 2.55m)*
Result	PP – Pocket penetrometer result (kN/m^2) HVP – Hand held shear vane result (kN/m^2) *PP result converted to an equivalent undrained shear strength by applying a factor of 50. Where at least 3 results obtained at same depth then an average value may be reported.*
	SPT – Standard Penetration Test result (uncorrected) *SPT(c) – Standard Penetration Test result (solid cone) (uncorrected)*

Sampling		
From (m) To (m)	Records depth of sampling	
Type	D	Disturbed sample
	B	Bulk disturbed sample
	J	Disturbed sample placed in sealed jar
	ES	Environmental sample comprising plastic and glass container
	W	Water sample
	U (32)	Undisturbed sample 100mm diameter sampler with number of blows of driving equipment required to obtain sample

Water observations

Described at foot of log and shown in the 'water strike' column.

▼	= water level observed after specified delay in drilling
▽	= water strike

Standpipe details

- Gravel filter
- Arisings
- Bentonite
- Slotted pipe
- Unslotted pipe

Density

Density recorded in brackets inferred from density testing and soil descriptions from across the site (i.e.: [Medium dense]).

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WELL	DESCRIPTION	LEGEND	DEPTH (m)	WATER STRIKE	TEST RESULTS TYPE/ DEPTH (m)	TEST RESULTS RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
	Grass over dark brown silty CLAY with frequent roots and rootlets and occasional fragments of brick. MADE GROUND								
			0.20		PP 0.25	50			
	Medium strength dark brown silty CLAY with rootlets and occasional fragments of brick. MADE GROUND								
			0.35		PP 0.40	46			
					PP 0.50	46			
	Medium strength brown mottled grey slightly sandy silty CLAY with rootlets and occasional fragments of brick and slag. MADE GROUND								
			0.65		PP 0.70	58			
	Medium strengthorange brown mottled grey silty CLAY. LONDON CLAY FORMATION				PP 0.90	42			
			1.00						
	Medium strength brown mottled grey silty CLAY with occasional roots observed. LONDON CLAY FORMATION				PP 1.10	38	1.10		D
					PP 1.30	38	1.30		D
					PP 1.50	58			
							1.60		D
					PP 1.70	71			
					PP 1.90	63	1.90		D
			2.00						
	Medium strength brown mottled grey silty CLAY with occasional black relic roots observed and some gravels of selenite crystals. LONDON CLAY FORMATION				PP 2.10	79	2.10		D
					PP 2.30	71	2.30		D
					PP 2.50	71	2.50		D
			2.70						
	Medium strength brown mottled grey slightly sandy silty CLAY. LONDON CLAY FORMATION				PP 2.70	75	2.70		D
					PP 2.80	96	2.80		D
					PP 3.10	75	3.10		D
	. . between thinly interlaminated with weak mudstone.				PP 3.20	108			
					PP 3.40	117	3.40		D
					PP 3.60	117	3.60		D
					PP 3.75	104			
							3.80		D
			4.00						
	Medium strength brown grey silty CLAY occasionally thinly interlaminated with SILT. LONDON CLAY FORMATION				PP 4.00	96	4.00		D
					PP 4.20	92			
							4.30		D
					PP 4.40	142			
					PP 4.60	121	4.60		D
					PP 4.80	138	4.80		D

CONTINUED ON NEXT SHEET

Notes:

Ground level (mAOD)

Co-ordinates

Title
Driven tube sampler borehole record

Surface breaking
No

Groundwater observations
No groundwater encountered.

Date of excavation (range if applicable)
13/03/2015

Appendix
-

Location plan on drawing number
01

DTS01

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WELL	DESCRIPTION	LEGEND	DEPTH (m)	WATER STRIKE	TEST RESULTS TYPE/ DEPTH (m)	TEST RESULTS RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
	BOREHOLE TERMINATED AT 6.00m		6.00						

Notes:

Ground level (mAOD)

Co-ordinates

Title
Driven tube sampler borehole record

Surface breaking
No

Groundwater observations
No groundwater encountered.

Date of excavation (range if applicable)
13/03/2015

Appendix
-

Location plan on drawing number
01

DTS01

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WELL	DESCRIPTION	LEGEND	DEPTH (m)	WATER STRIKE	TEST RESULTS TYPE/ DEPTH (m)	TEST RESULTS RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
	Grass over dark brown silty CLAY with frequent roots and rootlets and occasional fragments of brick. MADE GROUND		0.10						
	Low strength dark brown silty CLAY with fragments of brick and concrete. MADE GROUND								
	Medium strength orange brown mottled grey silty CLAY. LONDON CLAY FORMATION		0.90				0.90		D
					PP 1.20	63			
							1.30		D
					PP 1.40	50			
					PP 1.60	63	1.60		D
					PP 1.80	58			
							1.90		D
	Medium strength brown silty CLAY with occasional selenite crystals. LONDON CLAY FORMATION		2.00		PP 2.00	71			
					PP 2.10	63			
					PP 2.30	71			
					PP 2.50	54			
					PP 2.70	88			
					PP 2.90	100			
	Medium strength brown grey slightly sandy silty CLAY. LONDON CLAY FORMATION		3.00						
					PP 3.10	75	3.10		D
					PP 3.30	83			
							3.40		D
					PP 3.50	108			
							3.60		D
					PP 3.70	96			
					PP 3.90	100	3.90		D
	High strength brown slightly sandy silty CLAY with bands of possible selenite crystals. LONDON CLAY FORMATION		4.00						
					PP 4.10	108	4.10		D
					PP 4.30	150			
							4.40		D
					PP 4.50	154			
							4.60		D
					PP 4.70	150			
					PP 4.90	133	4.90		D

CONTINUED ON NEXT SHEET

Notes:

Ground level (mAOD)

Co-ordinates

Title
Driven tube sampler borehole record

Surface breaking
No

Groundwater observations
No groundwater encountered.

Date of excavation (range if applicable)
13/03/2015

Appendix
-

Location plan on drawing number
01

DTS02

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WELL	DESCRIPTION	LEGEND	DEPTH (m)	WATER STRIKE	TEST RESULTS		SAMPLING		
					TYPE/ DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	BOREHOLE TERMINATED AT 5.00m		5.00						

Notes:

Ground level (mAOD)

Co-ordinates

Title
Driven tube sampler borehole record

Surface breaking
No

Groundwater observations
No groundwater encountered.

Date of excavation (range if applicable)
13/03/2015

Appendix
-

Location plan on drawing number
01

DTS02

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DESCRIPTION	LEGEND	DEPTH (m)	WATER STRIKE	TEST RESULTS TYPE/ DEPTH (m)	TEST RESULTS RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
Dark brown and grey brown slightly sandy silty CLAY with occasional fragments of brick and occasional roots and rootlets. TOPSOIL		0.30						
Medium strength orange silty CLAY with frequent rootlets. MADE GROUND		0.90						
Dark brown and grey brown slightly sandy silty CLAY with occasional fragments of brick and occasional roots and rootlets. RELICT TOPSOIL		1.10						
TRIAL PIT TERMINATED AT 1.10m								

Notes: Trial pit sides remained upright and stable upon completion.

Ground level (mAOD)

Co-ordinates

Title
Trial pit record

Surface breaking
No

Groundwater observations
No groundwater encountered.

Dimensions (W x L)
0.30m x 0.30m

Date of excavation (range if applicable)
13/03/2015

Appendix
-

Method of excavation
Hand tools

Location plan on drawing number
02

TP01

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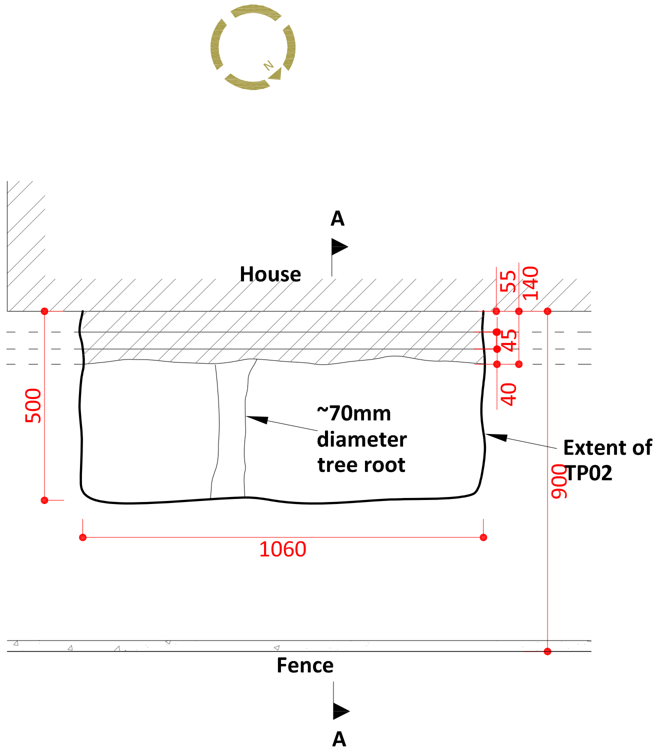
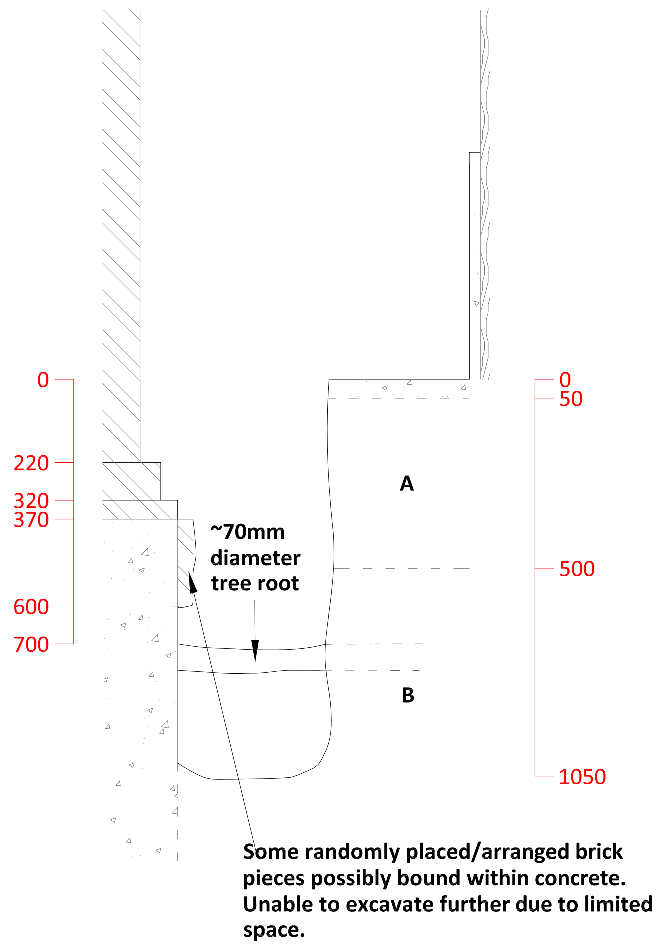
Plan



Section A-A



Photographic record

Key

A. Brown, black and grey brown slightly sandy silty CLAY with occasional fragments of brick and some rootlets. (MADE GROUND)

B. Medium strength orange silty CLAY with frequent rootlets. (MADE GROUND)

——— Observed features
– – – – Assumed features

Denotes brickwork

Denotes concrete

Notes

1. All dimensions shown in millimetres

Method of excavation Hand tools	Title Trial pit record	Trial pit number TP02	
Trial pit dimensions As shown	Date of excavation 06.03.2015	Location plan on drawing number 01	
Groundwater observations No groundwater encountered	Scale 1:20 at A3	Appendix	

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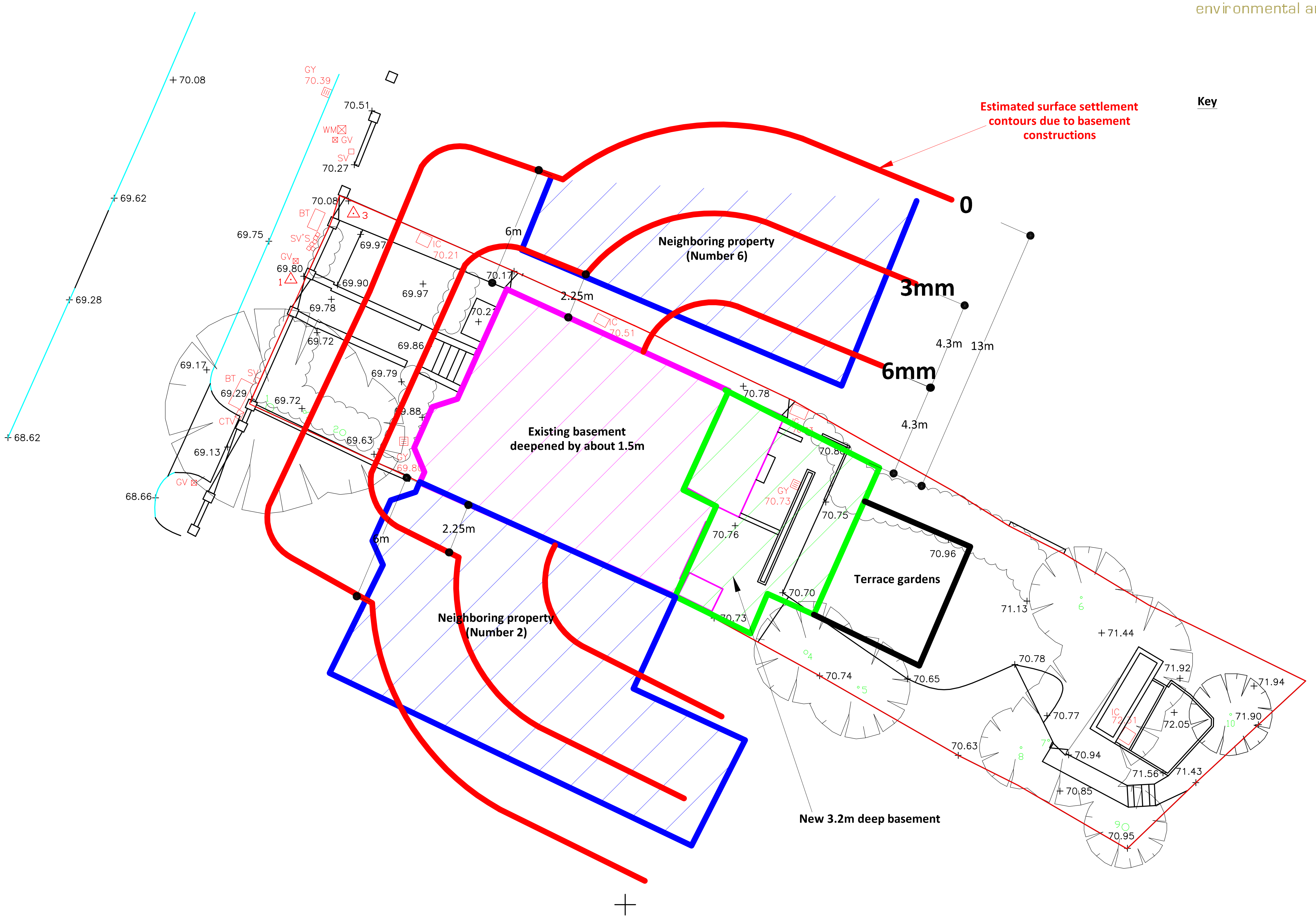

Title	Scale	Drawing number
Plan showing estimated surface settlement contours as a result of basement excavations	1:200 @ *A3*	02