Ilyas Amlani

6A GRANGE ROAD, LONDON

Basement Impact Assessment

Revision K

Volume 1 of 3

Independent, multidisciplinary engineering
and environmental consultants

6A GRANGE ROAD, LONDON, N6 4AP

Basement Impact Assessment

Client: Ilyas Amlani

Engineer: Create Consulting Engineers Limited
109-112 Temple Chambers
3-7 Temple Avenue
London
EC4Y 0HP

Tel: 0207 822 2300
Email: enquiries@createce.co.uk
Web: www.createce.co.uk

Report By: Andrew Warren BSc (Hons), MSc, FGS
Mark Salway BEng (Hons), CEng, MIStructE, MICE
Philip Lewis BSc (Hons), MSc, FGS, CGeol

Checked By: Colin Buchanan BSc (Hons), FGS

Approved By: Mark Salway BEng (Hons), CEng, MIStructE, MICE

Reference: AW/VL/P22-2546/02 Rev K

Date: May 2022

6A GRANGE ROAD, LONDON
Basement Impact Assessment – Revision K

6A GRANGE ROAD, LONDON, N6 4AP
Basement Impact Assessment
Revision K

Contents

Figures

Tables

Appendices

Registration of Amendments

Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By
Rev A 28/10/2022	Updated for amended architectural design	AW	CB/SS
Rev B 09/01/2023	Updated for amended architectural design	AW	CB/SS
Rev C 01/02/2023	Updated for amended architectural design	AW	CB/SS
Rev D 08/02/2024	Updated with revised building distance to No.8 GR	AW	CB/SS
Rev E 08/05/2024	Updated with final basement layout	AW	CB
Rev F 05/06/2024	Updated with revised Ground Movement Assessment	AW	CB
Rev G 07/06/2024	Updated following project team review	AW	CB
Rev H 12/06/2024	Recent groundwater monitoring and updated architects drawings	AW	CB
Rev I 23/11/24	Updated engineering design and architect plan	AW/MS	CB/MS
Rev J 26/11/24	Updated to address Client comments	AW/MS	CB/MS
Rev K 10/06/25	Updated following design review, hydrogeological, assessment and CRH audit	AW/MS	CB/MS

Non-Technical Summary

The site location is 6a Grange Road, Haringey, London, N6 4AP and the proposed development is for a single family dwelling with single storey basement.

The following assessments are presented:

- *Desk Study Assessment;*
- *Ground Investigation;*
- *Groundwater Investigation;*
- *Geological Interpretation and Geotechnical Design Parameters;*
- *Development of Hydrogeological Conceptual Site Model;*
- *Engineering Design proposals; and*
- *Ground Movement Assessment.*

Desk Study Assessment

Site was undeveloped open land until 1962, when the Site was developed with a single structure. The Site remained in this configuration until the most recent plan c. March 2020, when the original residential dwelling was demolished, site levels lowered and retaining walls installed in the rear garden area.

The surrounding area generally reduces in elevation to the northwest. There are no slopes greater than 7° and there are no man-made slopes within the vicinity of the Site.

Geological records indicate Site is underlain by strata of the Claygate Member (clay, silt and sand). The Claygate is classified as a 'Secondary A' aquifer', which are permeable layers that can support local water supplies and may form an important source to base water flow to rivers. The Site is not within a groundwater source protection zone and there are no groundwater abstractions within 2km of the Site. There are no rivers within 500m of the Site.

The Site specific flood risk assessment indicates the Site is not at risk of flooding

The Site is located within a conservation area.

Statutory services are located within Grange Road. There are no London Underground tunnels, Post Office tunnels or associated infrastructure within the vicinity of the Site.

A Site-specific arboricultural report identified mature trees to the front and rear of the proposed development.

Local reported geological information indicated Made Ground soils to approximately one metre below ground level, cohesive Claygate soils to approximately three metres below ground level and granular

Claygate soils to greater than twenty metres below ground level. Groundwater monitoring from local boreholes indicated groundwater levels between 2.98m and 3.91 metres below ground level (m bgl), with seasonal variation of 370mm to 850mm.

A total of 5No. constructed basements have been identified within Grange Road, with a further 2No. in View Road.

The preliminary risk assessment indicates there is a potential for Made Ground soils at the Site, which may contain asbestos, metals or hydrocarbons.

Ground Investigations

A total of 3No. ground investigations have been undertaken at the Site. The initial ground investigation was completed in July 2016. In December 2023, further site investigation was undertaken to help determine Site groundwater levels. In August 2024, a series of hand dug pits were undertaken to help determine the design of the existing retaining wall on the site.

Ground conditions at the Site comprised Made Ground over cohesive (clay) Claygate soils to approximately 2.0m bgl over granular Claygate soils to the maximum extent of the boreholes (13.2m bgl). The cohesive Claygate was indicated to be of intermediate to high plasticity. The sandy Claygate comprised a fine silty Sand of low permeability and included horizons of clay.

Groundwater monitoring was undertaken between June 2016 and September 2024. The highest variation recorded was between 108.82 metres above Ordnance datum (m aOD) and 109.5m aOD, a difference of 0.68m.

The garden retaining wall was found to vary in construction, but predominantly comprised mass concrete with a small footing at between 109.65 and 109.45m aOD, with negligible impact o groundwater flows.

Geological Interpretation & Geotechnical Design Parameters

Based on the ground investigation including laboratory test result and groundwater monitoring, a ground model has been developed of Made Ground underlain by cohesive (clay) strata of the Claygate Member underlain by granular strata of the Claygate Member. Cohesive (clay) horizons were record within the granular Claygate Member. For design purposes, a groundwater level of 109.34m aOD has been used.

The cohesive Claygate was of intermediate to high plasticity and, therefore, of high-volume change potential and of 'firm' strength. The granular Claygate Member comprised a silty Sand, with laboratory test results indicating it was of low permeability. The granular Claygate Member was indicated to be of 'medium dense' strength.

To achieve a minimum vertical bearing capacity resistance of 191kN, a 450mm diameter pile will require to be installed to a depth of 11.0m below ground level (101.3m aOD).

In clay soils classed as having medium to high potential for volume change, the removal of a tree can potentially result in swelling of the soil within the zone of influence of the tree roots. This is because of the tree no longer taking-up water from the ground results in an increase in soil moisture content leading to swelling. The zone of influence of a tree depends upon the type of tree and its height. The removal of the 2.0 m tall Goat Willow at a distance of approx. 8.10m to the rear of No.8 Grange Road, will not impact upon foundations of the neighbouring properties.

To resist corrosion from sulphates, buried concrete should be designed a classification of DS-1, AC-2z.

Hydrogeological Conceptual Site Model

To determine if the proposed development will impact upon the local groundwater regime and adjacent properties, a hydrogeological assessment considering ground conditions, groundwater levels and existing basements in the vicinity of the proposed was undertaken. This concluded that the proposed development will have negligible impact on recharge of the underlying aquifer.

In the context of the local area (local basements, local geology and groundwater levels), the proposed basement will present a very limited obstruction to groundwater flow.

The assessment completed suggest that any changes in groundwater levels as a result of basement construction will be minimal and will not impact upon neighbouring properties.

Pumping out of water within the basement excavation is not anticipated to significantly impact upon groundwater levels external to the basement construction (basement box).

Engineering Design Proposals

A single storey basement below the new private dwelling is proposed. The basement is formed using concrete piles – vertical circular interlocking columns in the ground - to create a perimeter wall to form the outline of the basement.

The interlocking piled basement wall is constructed using a machine called a continuous flight auger piling rig, like a large corkscrew, which drills into the ground and as it is extracted from the ground it replaces the soil displaced with a concrete column.

The basement living space is constructed by excavating the soil from in between the installed piles from the top down and the excavated spoil taken off site.

The lower half of the basement is below the groundwater level, therefore, water within the basement excavation during construction will be extracted by pumping to tanks and taken off-site under licence.

The interlocking piled walls prevent horizontal leakage of water into the excavation and the length of pile wall (embedment) below the basement will limit water entering from below. This means the surrounding groundwater outside of the basement is not affected.

The ground and basement floors are constructed in concrete, connected to the basement piled walls and lined with concrete to make the basement watertight.

Temporary steel bracing struts are installed during excavation until the basement floor is constructed to reduce potential ground movement while the soil is excavated and before the permanent structure is in place.

The potential ground movement caused by the installation of the basement walls and the excavation of the ground to construct the basement, deflection of the walls during the excavation and settlement over the long term has been investigated. Ground movement around the basement perimeter and potential impact on neighbouring properties and infrastructure has been assessed and compared against criteria for damage assessment to adjacent properties.

The proposed basement construction and construction methodology limits potential damage to neighbouring properties and infrastructure to 'very slight' defined as fine cracks that can easily be treated during normal decoration.

During construction a regime of monitoring and protocols will be implemented to check ground movement is in accordance with predictions.

An assessment of the potential 'damming effects' of the basement on groundwater flow in the wider area concluded this has negligible impact.

<u>Ground Movement Assessment</u>

Installation of the basement piled walls and deflection of the basement walls during excavation of the soil will cause ground movement.

An assessment of ground movement likely to occur as a consequence of the basement construction and in the long term has been undertaken following industry guidance (CIRIA C760).

The ground movement assessment uses semi-empirical methods, using data from previous developments to estimate ground movement caused by pile installation and using computer modelling software (WALLAP) to analyse ground movements following excavation behind the basement wall.

The ground movement calculated has been used to assess the impact (likely damage) to adjacent structures (neighbouring properties) and infrastructure. This assessment concludes that the neighbouring properties No. 6 and No. 8 Grange Road can be limited to building damage category 1 (very slight), defined as fine cracks that can be easily treated during normal decoration.

1.0 INTRODUCTION

Brief

1.1 Create Consulting Engineers Ltd (CCE) have been instructed by Cassion Castle Architects, on behalf of Ilyas Amlani (the 'Client'), to undertake a Basement Impact Assessment in support of a planning application for the development of the land at 6a Grange Road, Haringey, London, N6 4AP.

Project Context

1.2 The proposed residential development for a single family dwelling is to include a single storey basement as part of a new build construction at the Site. This Basement Impact Assessment (BIA) has been produced to support the planning application for the proposal. For reference, Architects' plans are presented in Appendix A.

1.3 Topographical levels used within this report are based on Ordnance Datum levels, as detailed within the RGL topographical survey (ref. RGL-24-4230-01, dated September 2024), which for reference is reproduced in Appendix B.

1.4 The BIA has been produced following the Haringey Strategic Plan (Development Management DPD, adopted July 2017), Policy DM18: residential basement development and light wells, which states:

> '*Householder extensions to existing basements, and the construction of new basements, including in existing dwellings will only be permitted where it can be demonstrated that the proposal*':
>
> - Will not adversely affect the structural stability of the application building, neighbouring buildings and other infrastructure, including the adjoining highway, having regard to local geological conditions;
> - Does not increase flood risk to the property and nearby properties from any source (see Policy DM24);
> - Avoids harm to the appearance or setting of the property or the established character of the surrounding area;
> - Will not adversely impact the amenity of adjoining properties by reason of noise or increased levels of internal or external activity;
> - Will not adversely impact the local natural and historic environment;
>
> '*And, where the proposed basement extends beneath the garden area':*
>
> - Will not cause loss, damage or long-term threat to trees of townscape or amenity value;

- Maintains adequate soil depth satisfactory for preservation of landscaping consistent with neighbouring properties.

1.5 The key elements of this Basement Impact Assessment are:

- Desk Study assessing the history, geology, hydrogeology, hydrology and buildings local to the Site;
- Site Investigation comprising a visual Inspection of property, inspection of Site and adjacent sites and borehole investigation;
- Monitoring and assessment of Site groundwater levels;
- Geological Interpretation and Geotechnical Design Parameters
- Hydrogeological Concept Site Model;
- Engineering Proposals including engineering design and temporary works; and
- Ground Movement and Building Damage Assessment.

Objectives

1.6 To undertake an assessment in accordance with the Borough of Haringey's basement policy (DM18), to demonstrate the basement can be designed to safeguard the structural stability of nearby buildings and infrastructure including London Underground assets and the local water environment, where applicable.

Scope of Work

Desk Study Assessment

1.7 The Desk Study comprised a review of the following information sources:

- Site Walkover Survey and adjacent area reconnaissance to review adjacent buildings, basements, etc. where access is available;
- Assess history, topography, geology and ground conditions, hydrogeological and hydrological conditions (groundwater/aquifers, water courses, historical water courses, etc.);
- Review local services and infrastructure (including utilities services, drains and tunnels and listed buildings);
- Review of available ground conditions (incl. groundwater) via BGS and other sources;
- Assess potential flood risk; and
- Review other basement developments in the area, so that cumulative effects can be considered.

1.8 A Site Walkover Survey was initially undertaken on 3 February 2022 to establish the current site condition and is documented with photographs (Appendix A), although a number of subsequent site visits were subsequently undertaken in 2023 and 2024.

Ground Investigation

1.9 A Ground Investigation is required to prove the ground conditions and develop the structural design, including an assessment of groundwater movements and temporary works and the shallow underlying groundwater conditions. The proposed scope of the investigation was as follows:

- 1No. cable percussive borehole within the rear garden to a maximum depth of 13.20m (or refusal);
- 2No. windowless sample boreholes within the front garden to a maximum depth of 10.0m (or refusal);
- The soil arisings from each trial pit/borehole will be logged by a suitably qualified Engineer, in line with the relevant British Standard (BS 5930 and Eurocode 7);
- Monitoring wells will be installed in the boreholes, with a gas bung and concreted flush cover to enable subsequent monitoring of ground gas and groundwater levels;
- 2No. hand dug trial pits to confirm existing foundations (where accessible);
- Geotechnical testing to include classification, strength and aggressiveness to concrete; and
- 1No. return site visit to measure ground gas concentrations and groundwater levels.

1.10 An interpretative site investigation report detailing findings of desk study and site investigation and provide a geotechnical appraisal of the ground conditions and suitability of foundations and other construction works proposed.

Groundwater Investigation

1.11 The initial ground investigation of May 2018 included limited groundwater monitoring prior to demolition works incapacitating installed monitoring wells. Therefore, in December 2023, 3No. monitoring wells were installed and groundwater monitoring undertaken to determine standing groundwater levels across the Site.

Geological Interpretation and Geotechnical Deign Parameters

1.12 This Section of the report provides an interpretation of ground conditions at the Site, including local groundwater flow analysis, geotechnical design parameters and pile bearing capacities.

Hydrogeological Conceptual Site Model

1.13 To help determine if the proposed development will impact upon the local groundwater regime and adjacent properties, a hydrogeological assessment considering ground conditions, groundwater levels and existing basements in the vicinity of the proposed was undertaken.

1.14 An assessment of the potential impact of pumping water out of the basement excavation on local groundwater and adjacent properties

1.15 A hydrogeological review has been undertaken by a qualified Hydrogeologist and Chartered Geologist (Philip Lewis BSc (Hons), MSc, FGS CGeol) from LMB Geosolutions Ltd.

Engineering Design Proposals

1.16 Using information obtained from the site-specific ground investigation and architects plans, an engineering design and construction methodology has been outlined for the basement including the retaining structures and measures to address ground movement, party wall issues, temporary works, monitoring, etc.

1.17 The following list is a summary of the requirements of the engineering design and our proposed scope:

- Details of the engineering design with relevant drawings provided to show how the designers have addressed vertical loads, horizontal loads, ground conditions, adjoining buildings & structures, overall stability (permanent & temporary works) and any other special considerations; and
- Drawings to show the arrangement of basement development and the relationship to adjoining buildings.

1.18 The Construction Sequence Methodology (CSM) will be prepared and signed off by a Chartered Structural Engineer (MIStructE).

Ground Movement Assessment (GMA)

1.19 A ground movement assessment in accordance with guidance laid out in CIRA document C760, '*Guidance on Embedded Retaining Wall Design',* dated 2017, was used to analyse the impact of any potential ground movement on buildings within influencing distance of the proposed works.

Constraints and Limitations

1.20 The copyright of this report is vested in Create Consulting Engineers Limited and the Client, Ilyas Amlani. The Client, or their appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Limited or the Client.

1.21 Create Consulting Engineers Limited accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

1.22 Create Consulting Engineers Limited has endeavoured to assess all information provided to them during this appraisal. Should additional information become available which may affect the opinions expressed in this report, Create Consulting reserves the right to review this information and, if warranted, to modify the opinions presented in the report accordingly.

1.23 The report summarises information from a number of external sources and is unable to offer any guarantees or warranties for the completeness or accuracy of information relied upon. Information from third parties has not been verified by Create Consulting Engineers Limited unless otherwise stated in this report.

1.24 It should be noted that the risks which are identified in this report are perceived risks based on the available information at the time of writing and that the actual risks associated can only be assessed following a physical investigation of the site.

1.25 The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

2.0 SITE LOCATION AND DESCRIPTION

Site Location

2.1 The development Site is located at 6a Grange Road, Highgate, London, approximately 570m west of Highgate underground station. The Site can be centred on National Grid Reference 528010, 188063 and the nearest postcode is N6 4AP.

2.2 The Site location is shown on Figure 2.1 below:

Figure 2.1: Site Location Plan (Ordnance Survey)

Site Description

2.3 The Site is rectangular irregular in shape, orientated in a NEE/SWW aspect and approximately 440m^2 in plan area.

2.4 The Site is bound to the northwest by No.6 Grange Road, to the northeast by Grange Road, with residential properties beyond, to the southeast by No.8 Grange Rd and to the southwest by rear gardens of adjacent properties. Figure 2.2 (below) details the Site in relation to adjacent to the surrounding land use.

Figure 2.2: Site Layout

2.5 A Site Walkover Survey was undertaken on 3rd February 2022 (and subsequently in 2023 and 2024), with photographs taken during the walkover survey presented in Appendix C.

2.6 At the time of inspection, the Site was secured by hoarding and had been cleared of the former residential property (see Plates P1, P2 and P3). The bulk of the site has been reduced in level as part of a previous development and a retaining wall was located along the northern, western and southern boundaries, see Figure 2.2 and Plates P2, P4 and P5.

2.7 The structure of the retaining wall was established through a hand pitting site investigation completed in August 2024 (see Appendix H4).

2.8 The surrounding land use to the Site is residential.

Neighbouring Properties

2.9 The following descriptions are provided when facing the front of the building.

No. 6 Grange Road – adjacent property to northwest

- Property age approximately 60 years old.
- Property use is residential.
- Two-storey building with single storey side extension to the south.
- There were no signs of ongoing structural movement that were from the outside of the building.

No. 8 Grange Road – adjacent property to southeast

- Property age is in excess of 125 years old.
- Property use is residential.
- Two-storey building with conservatory extension proximal to Site boundary.
- There were no signs of ongoing structural movement that were from the outside of the building.

Local Topography & Groundwater Flow

2.10 The topography across the local area slopes from south east to northwest at an average slope of 2 to 3°. Since demolition, the Site sites at a lower elevation than the surrounding land at an elevation of between 110.47m aOD to 112.18m aOD.

2.11 It is understood that the regional groundwater flow direction follows the local topography, from south east to north west.

3.0 DESK STUDY

Introduction

3.1 The following reports, drawings and accessed websites pertinent to this assessment are detailed in Table 3.1 below.

Document/Website	Author/Publisher	Date
British Geological Survey 1:50,000 series, Solid and Drift, Sheet 256 North London	British Geological Survey	Reviewed March 2022
BGS Geoindex – Geology and borehole records – www.bgs.ac.uk/geoindex	British Geological Survey	Accessed March 2022
Public Health England radon maps: http://www.ukradon.org/information/ukmaps	Public Health England	Accessed March 2022
Flood maps, groundwater mapping, groundwater abstraction locations, landfill sites, pollution incidents and nitrate vulnerable zones – www.environment-agency.gov.uk	Environment Agency (EA)	Accessed March 2022
Architects Basement Plan P100-102, 200 and 300	Cassion Castle Architects	June 2025
ZETICA UXO maps	https://zeticauxo.com	Accessed March 2022
Groundwater Investigation Technical Note	Create Consulting	Jan. 2024
No.8 Grange Road: Basement Impact Assessment	Alan Baxters	Nov. 2014

Table 3.1: Key Information Sources

Historical Map Review

3.2 Historical Ordnance Survey plans of the site have been viewed using available online historical mapping and Google Earth imagery.

3.3 A summary of these findings are provided in Table 3.2 below.

Dates	Scale	Onsite	Surrounding Land Use
1894	1:2,500	Field boundary passing NW/SE through central section of Site. Second field boundary within northern corner of Site	Site surrounded by open fields. Residential development approx. 90m NE.
1896	1:2,500	Building NE of central field boundary. Second field boundary no longer detailed.	Grange Road detailed adjacent NE. 'The Grange' house constructed approximately 15m SE. Large residential buildings opposite Grange Road and 110m south. Possible earthworks adjacent to Site's SW boundary.
1915	1:2,500	No apparent change.	Terraced residential development 150m north and east
1935	1:2,500	Building within/adjacent to Site's NW boundary.	Large residential properties 55m north.
1945	Google Earth	No apparent change.	No apparent change.
1952-53	1:2,500	Possible small structure within SW section of Site.	No apparent change.
1962-68	1:1,250	Redevelopment of Site with single structure.	Residential development adjacent north.
Sept. 1999	Google Earth	No apparent change.	No apparent change.
June 2019	Google Earth	Site cleared of all structures.	No apparent change.
March 2020	Google Earth	No apparent change.	No apparent change.

Table 3.2: Historical Review

Potential Contaminative Historical Elements

3.4 The historical map search records several potential sources of contamination within the Site boundary and surrounding area. Former onsite structures and field boundary are potential areas of weak ground and any foundations not grubbed out are potential obstructions to development. Potential for earthworks adjacent to Sites southwest boundary.

Unexploded Ordnance (UXO)

3.5 An historical record bomb search was undertaken in the vicinity of 6a Grange Road, which indicates the Site is of low to moderate risk from UXO, as shown in Figure 3.1 below.

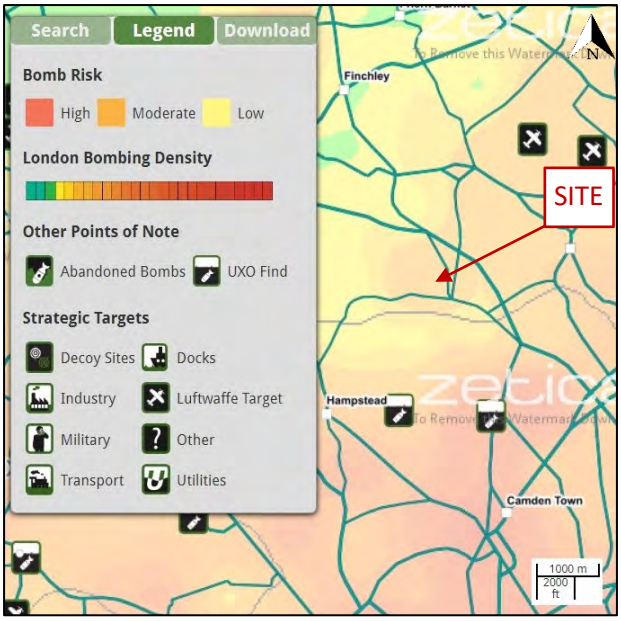


Figure 3.1: Zetica UXO map (source: ZETICA)

3.6 The findings of the search have not identified any potential bomb sites within close proximity of the Site and is indicated to be of low to moderate risk from UXO. On this basis, the Site is not considered to be at risk from WWII UXO.

Listed Buildings

3.7 The Historic England interactive maps were accessed to determine the presence of any listed building within the vicinity of 6a Grange Road, the results of which are presented in Figure 3.2 below.

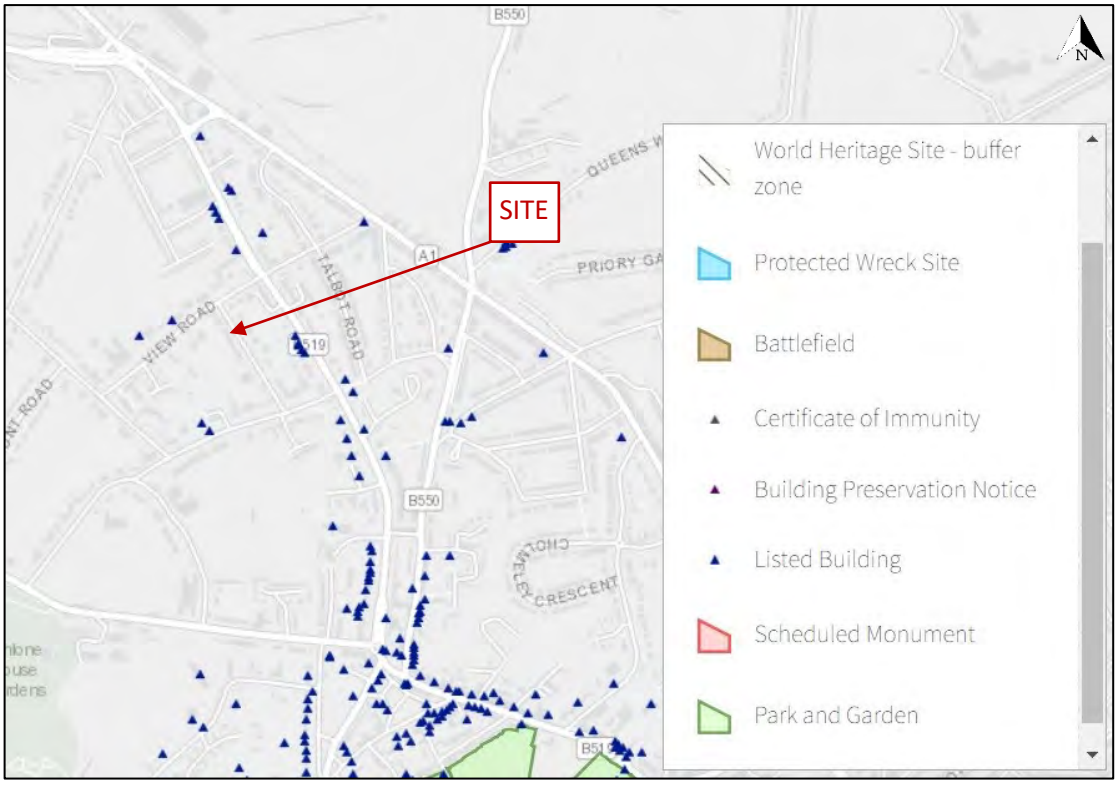


Figure 3.2: Extract from Historic England Maps

3.8 The Historic England interactive maps indicate 6a Grange Road is not a listed building and that the nearest listed buildings are approximately 110m east of the Site.

Surface Features of the Site and Surrounding Area

3.9 The topography surrounding area reduces in elevation to the northwest. There are no cuttings or significant slopes (greater than 7 degrees) close to the site. There are no significant man-made slopes within 20m of the site boundary.

Geology

3.10 Reference has been made to the BGS 1:50,000 Solid and Drift map of the area, Sheet 256 (North London), dated 2006, an extract of which is presented as Figure 3.3, below. The geological plans indicate the Site is underlain by solid strata of the 'Claygate Member'. The BGS map records detail these deposits as predominantly comprising clay, silt and sand. There are no superficial deposit indicated at the Site.

3.11 There are no online BGS records within the vicinity of the Site. However, a BGS borehole (reference TQ28NE439) located approximately 170m west of the Site recorded the following ground conditions:

- Ground level to 0.80m: Made Ground.
- 0.80m to 3.0m: Firm orange-brown mottled grey silty sandy CLAY.

- 3.0m to 5.0m: Firm grey fissured silty CLAY.
- 5.0m to 15.0m: Firm grey very silty very sandy CLAY.

3.12 In line with BGS mapping of the area, the clay description is interpreted as weathered Claygate Member. A single groundwater strike was recorded at 6.50m, rising to 5.80m after 20minutes. Subsequent monitoring of the installed standpipe recorded groundwater at 1.70m bgl.

3.13 No geological faults are indicated within the vicinity, or within influencing distance of the site.

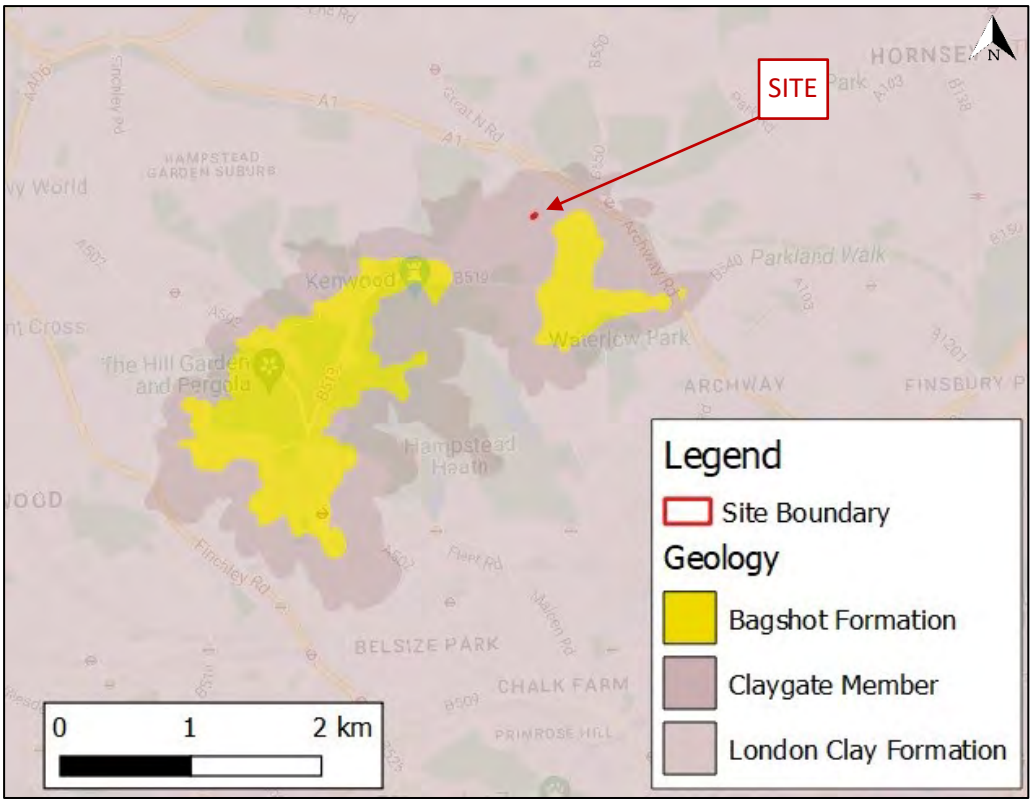


Figure 3.3: Site Geology (British Geological Survey)

3.14 Boreholes undertaken adjacent to the Site at No.8 Grange Road as part of a basement impact assessment by Alan Baxter (ref.1675/100, dated November 2014) confirm the ground conditions of interbedded clayey sand / sandy clay. Groundwater was recorded at levels of between 2.98m bgl and 3.91m bgl – groundwater levels are further analysed in Section 6 of this report.

Radon

3.15 The Public Health England online UK records for radon have been searched to help determine if there is a radon risk to the site. A map extract of the site and surrounding are presented in Figure 3.4 below.

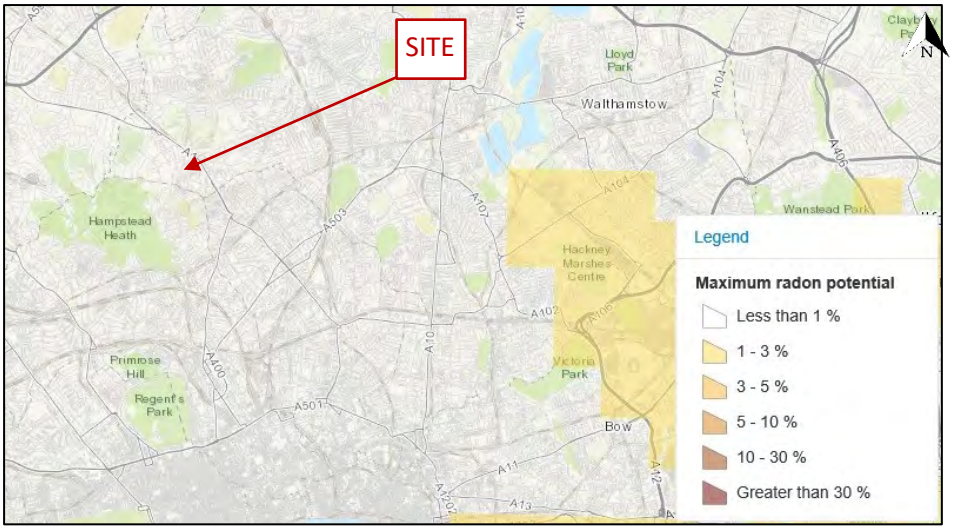


Figure 3.4: Extract from Public Health England Radon Map

3.16 The site is indicated to be in a lower probability radon area with less than 1% of properties above the action level. On this basis, no radon protective measures are necessary in the construction of new dwellings or extensions.

Hydrogeology

3.17 Geological plans indicate there are no superficial deposits beneath the Site. Environment Agency hydrogeology maps for the area classifies the bedrock beneath the site as a '*Secondary A*' aquifer which is described as '*permeable layers that can support local water supplies, and may form an important source of base flow to rivers*', as detailed in Figure 3.5, below.

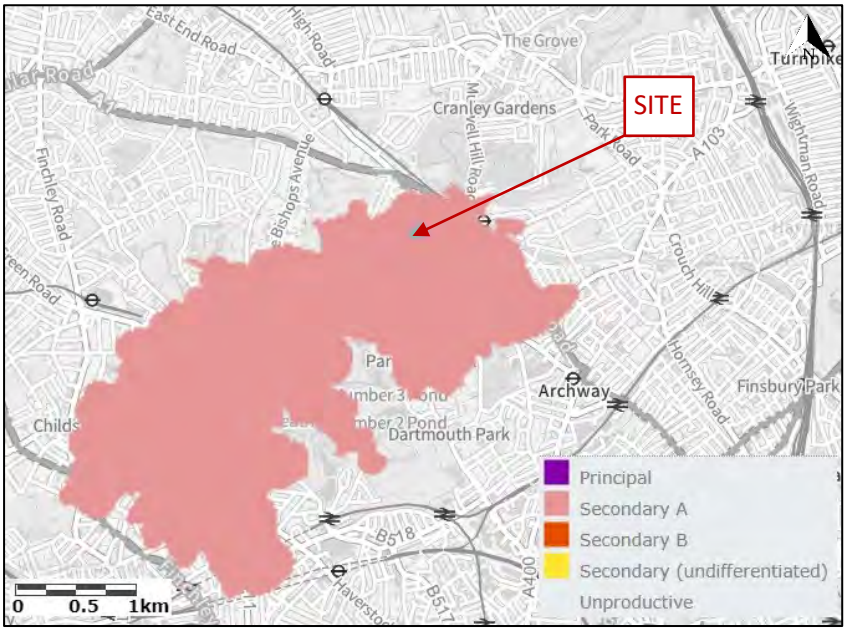


Figure 3.5: Aquifer Designation (Environment Agency)

3.18 The Secondary A aquifer is designated as being of '*medium*' vulnerability (see Figure 3.6), which are detailed by the Environment Agency as: 'areas that offer some groundwater protection. Intermediate between high and low vulnerability'.

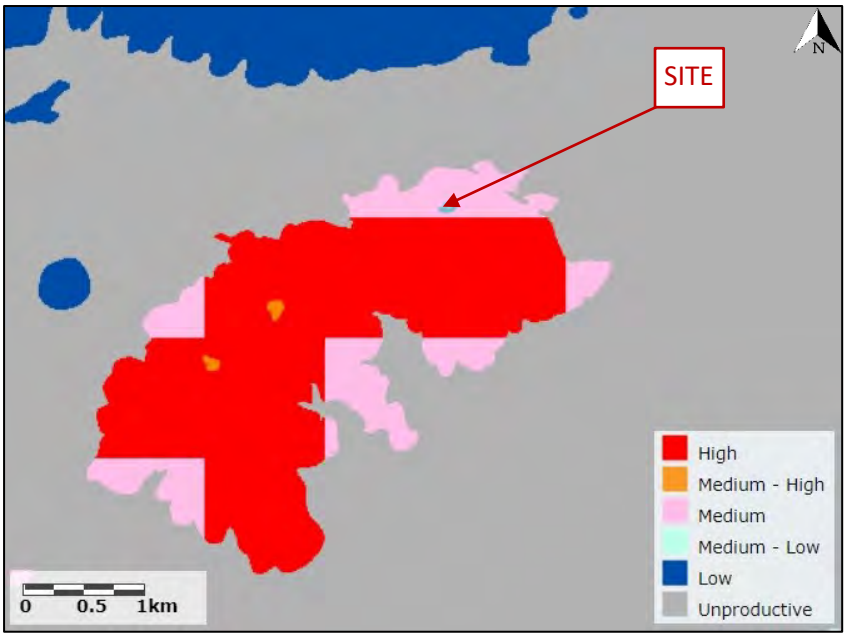


Figure 3.6: Groundwater vulnerability (Environment Agency)

3.19 Environment Agency mapping indicates the site is not located within a designated Groundwater Source Protection Zone, as detailed within Figure 3.7, below. Nor are there any groundwater abstractions within 2km of the Site.

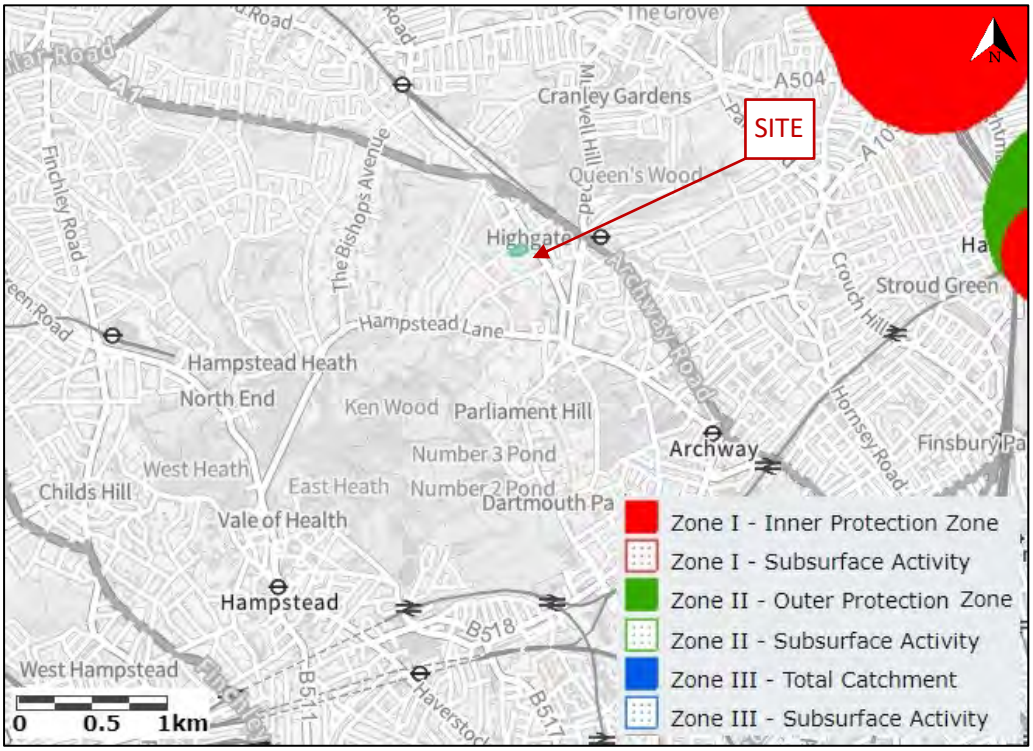


Figure 3.7: Source Protection Zones (Environment Agency)

Hydrology

3.20 There are no primary, secondary or tertiary rivers identified within the site boundary or within 500m of the site boundary. The closest watercourse is located 640m south, linked to a pond. The connectivity of the pond is not known. A second watercourse appears to be linked to Mutton Brook, located 650m northwest of the Site. Mutton Brook is a tributary of Dollis Brook, which in turn is a tributary of the River Brent, which flows int the Thames. Dollis Brook is indicated to be of '*moderate*' ecological quality. However, has been classified as a '*fail*' in relation to chemical classification.

3.21 There are no licensed surface water abstractions within 1km of the site.

Flood Risk

3.22 A Flood Risk Assessment and drainage strategy has been completed for the Site and latest design proposal and this is included as Appendix D.

3.23 It has been concluded that no significant sources of flooding have been identified as part of this study that warrant further consideration as part of a more detailed Flood Risk Assessment.

3.24 A number of mitigation measures are recommended to address the low risk of groundwater flooding and residual risks of surface water, public sewers, site drainage, and public and internal water supply pipe work/storage. These risks can be managed by the design of the site drainage, by regular inspection and maintenance of the public and private sewer and water supply network. Furthermore, high groundwater levels and root protection zones have been highlighted as potential issues within the detailed drainage strategy and these will need to be considered as part of the design process at the detailed design stage.

Underground Statutory Utilities and Local Services

3.25 There are public foul sewer and surface water sewers (both 229 mm respectively) flowing in a northerly direction laid within the Grange Road highway corridor.

3.26 All properties in the area (including the site itself) are assumed to be connected to the public foul and surface water drainage network. It is understood that the site currently connects to the public sewer in Grange Road via a gravity sewer at the front of the property.

3.27 Within the pavement or road of Grange Road, there are access covers indicative of a range of utilities services.

London Underground Infrastructure

3.28 The Northern Line is approximately 350m northeast of the site using the 'true geography of the London Underground, as outlined in Figure 3.8 below.

3.29 At this distance, the site is not considered to be within influencing distance of the London Underground Ltd (LUL) asset.

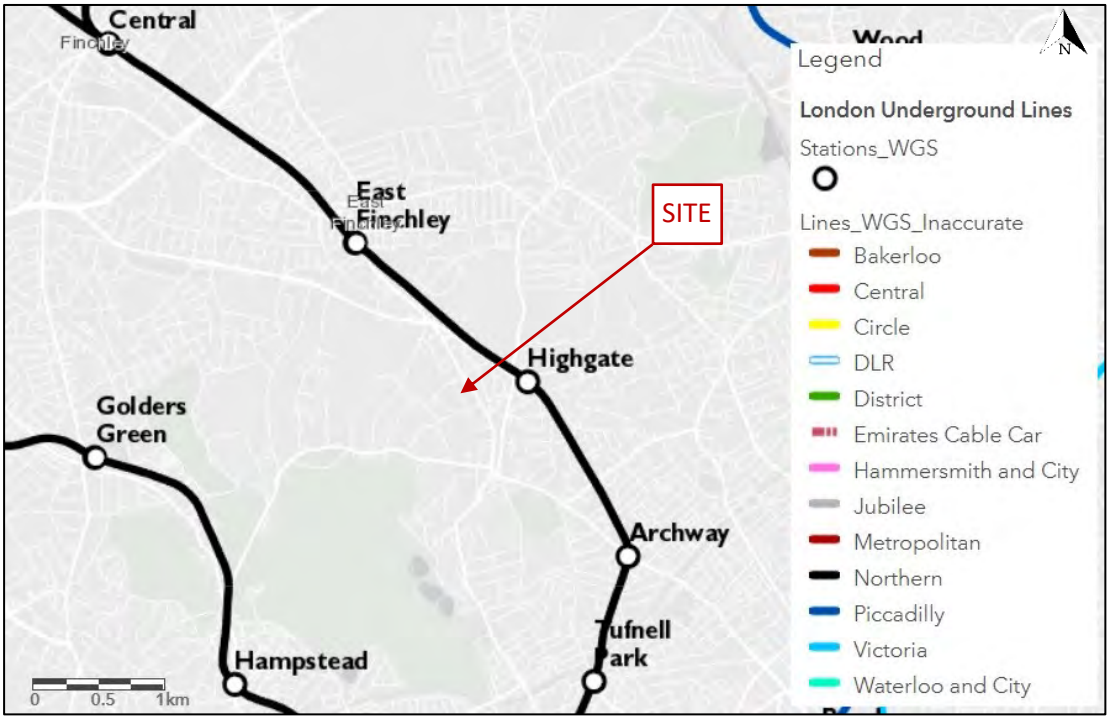


Figure 3.8: London Underground Network

Post Office Tunnels

3.30 The Post Office tunnel network is detailed within Figure 3.9, below. The Site is located approximately 4km north of Regents Park and therefore outside the Post Office network of tunnels.

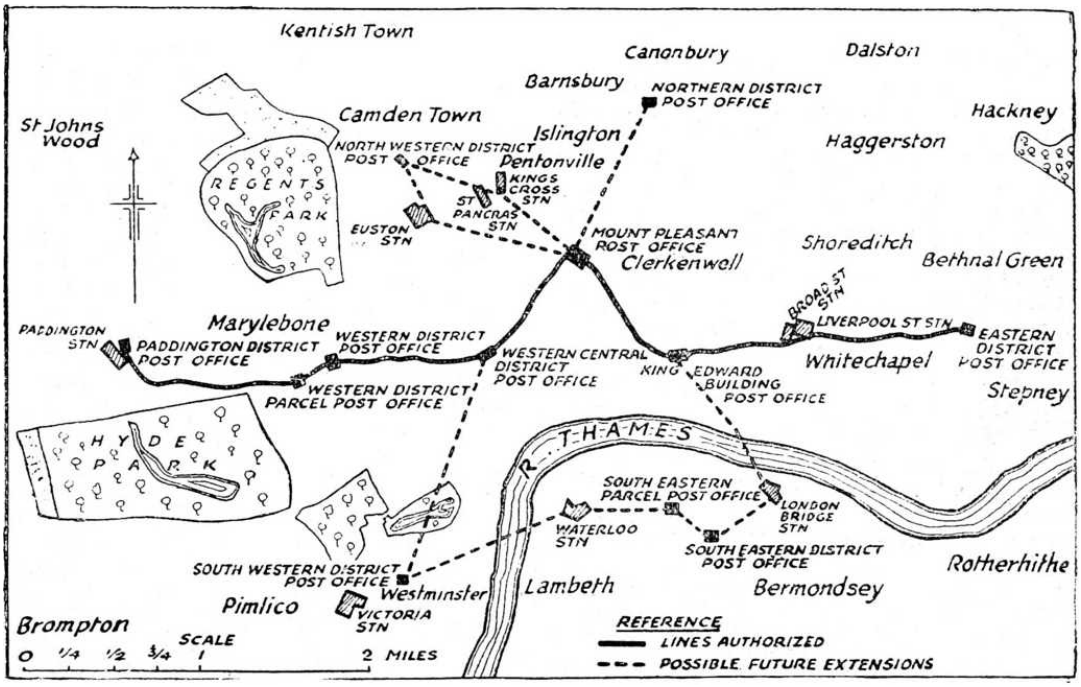


Figure 3.9: Post Office Tube Railway Route, London

Trees

3.31 Mature trees are located within the pavement and front gardens of Grange Road, with the nearest being in the front garden of the site on the right hand side as you face the property from Grange Road adjacent to the public footway. The Arboricultural Impact Assessment report (provided in Appendix E) detailed the following:

On-site trees present are:

- Front – sycamore; and
- Rear – Goat Willow, Buddleia and Birch.

3.32 Off-site proximal trees present are:

- No.6 Grange Road - rear: yew tree; and
- No.8 Grange Road – front: horse chestnut.

Ecology

3.33 Environment Agency mapping indicates there are no Sites of Special Scientific Interest, National Nature Reserves, (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, ancient woodlands, world heritage sites, Local Nature Reserves (LNR), environmentally sensitive areas, Areas of Natural Outstanding Beauty (AONB), National Parks (NP), Nitrate Vulnerable Zones, green belt or any other environmental designations

within 500m of the site, as detailed within Figure 3.10, below. The Site is located within a conservation area.

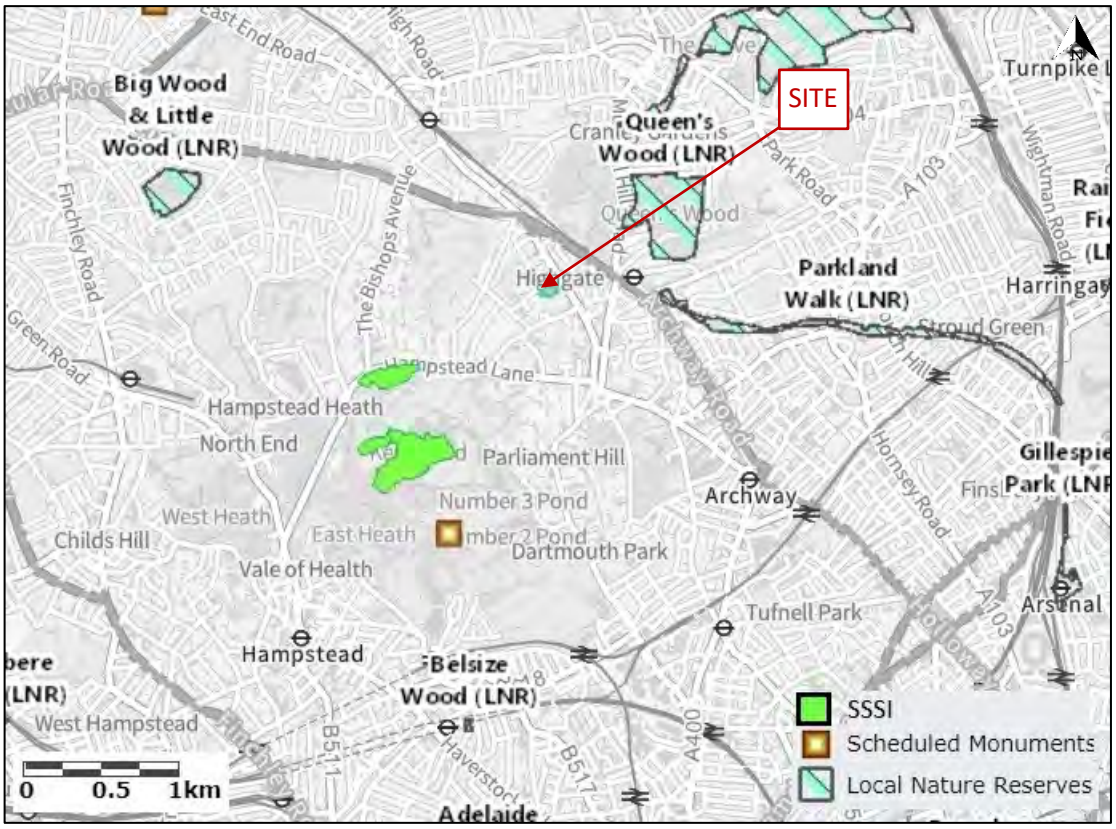


Figure 3.10: Ecological Setting

Local Basement Impact Assessments

3.34 In support of a previous planning application, a Basement Impact Assessment was undertaken for No.8 Grange Road (Alan Baxter report ref. 1675/100), which is presented in Appendix F.

3.35 The BIA completed for No.8 Grange Road included summaries of borehole records: BH01, undertaken at No.8 Grange Road (dated June 2013) and BH2, undertaken at No.10 View Road (dated August 2006). Ground conditions from the two boreholes have been summarised in Table 3.3, below.

Location	Made Ground (m bgl)	Claygate – cohesive (m bgl)	Claygate – granular (m bgl)	Groundwater Strike (m bgl)
BH01	1	3.3	>12*	3.8
BH2	1	3	>20*	3.2

Table 3.3: No.8 Grange Road BIA Borehole Summary – Depth to Base

*base of formation not encountered

3.36 The BIA for No.8 Grange Road included groundwater monitoring, undertaken over a 12-month period (May 2013 to May 2014). Recorded groundwater levels were at depths of between

109.85m aOD and 108.991m aOD, with levels generally greater than 109.23m aOD, as summarised in Table 3.4, below.

	BH01 (112.9m aOD)		BH2 (112.83 aOD)	
Date	**Level (m bgl)**	**Level (aOD)**	**Level (m bgl)**	**Level (aOD)**
09/05/2013	3.81	109.09	3.62	109.21
16/05/2013	3.8	109.1	3.61	109.22
23/05/2013	3.84	109.06	3.64	109.19
11/10/2013	**3.91⁺**	**108.99**	**3.83⁺**	**109**
06/12/2013	3.83	109.07	3.66	109.17
07/02/2014	**3.54***	**109.36**	**2.98***	**109.85**
07/03/2014	3.65	109.25	3.36	109.47
12/05/2014	3.79	109.11	3.63	109.2
Average	**3.77**	**109.13**	**3.54**	**109.29**
Variation	**370mm**		**850mm**	

Table 3.4: Summary of groundwater monitoring, No. 8 Grange Road BIA

* highest ⁺ lowest

3.37 The basement for No. 8 Grange Road was not constricted. Other basements indicated to have been constructed in the area include Nos. 3, 5, 10, 18-22, and 24 Grange Road, as well as Nos. 8 and 10 View Road, as presented in Figure 3.11, below.

Figure 3.11: Local Basements

Preliminary Ground Contamination Risk Assessment

3.38 In accordance with guidance outlined by DEFRA and the Environment Agency's Land Contamination Risk Management (LCRM) guidance (2020), a Preliminary Risk Assessment (PRA) has been formulated for the Site. A preliminary Conceptual Site Model (CSM) has been developed using potential source-pathway-receptor linkages using a combination of the likelihood of a pollution event to occur, taking account of the presence of a hazard (or source) and integrity of a pathway, versus the consequence of a pollution occurrence, which is essentially a measure of the severity of a hazard to an identified receptor (such as future sensitive end-users).

3.39 The presence of contamination (as a potential hazard) does not necessarily mean that there is a risk. It is the exposure pathway and the quantity of contamination that reaches the receptor which may determine the effect on a receptor.

3.40 The risk classification for both likelihood and consequence is based on methodology presented in Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA C552, 2001) and has been developed from procedures outlined in the EA's LCRM guidance. The DETR, with the EA and Institute of Environment & Health, has also published guidance on risk assessment (Guidelines for Environmental Risk Assessment and Management). The guidance states that the designation of risk is based upon a consideration of both:

- The magnitude of the potential consequence (severity) of risk occurring which takes into account both potential severity of the hazard and sensitivity of the receptor; and
- The likelihood of an event occurring (probability) which takes into account the both the presence of the hazard and receptor and the integrity of the pathway.

3.41 The magnitude of consequence (severity) and likelihood (probability) is defined in the CIRIA guidance, together with examples. The two classifications are then compared to obtain an estimation of risk for each pollution linkage, ranging from "very high risk" to "very low risk" (Appendix G). A description of the risks and likely actions are as follows:

Very High Risk: There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening.

If this risk is realised, it is likely to result in significant environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation (if not already undertaken) and remediation is likely to be required.

High Risk:	Harm is likely to arise to a designated receptor from an identified hazard. If risk is realised, it is likely to present a sizeable environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation is required and remediation work may be necessary in the short term and likely over the longer term.
Moderate Risk:	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the potential environmental liability. Some remedial works may be required over the longer term.
Low Risk:	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild. Limited investigation may be recommended to clarify the risk, dependant on the sensitivity of the receptor and view point of those of interest. Any remedial works are likely to be fairly limited.
Very Low Risk:	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is likely to be mild or minor.

3.42 The benefit of estimating the risk in this way is that it can be revised after each investigation phase as the conceptual model and corresponding pollution linkages are refined.

3.43 The risk assessment is based on the proposed residential end use and presented in Table 3.5, below. Should the development proposal change, the risk assessment should be revised accordingly.

Source	Pollutant	Pathway	Receptor	Likelihood of Occurrence	Consequence (severity)	Potential Risk	Possible Mitigation Measures	Residual Risk
Made ground associated with prior construction works (Residential use only	Asbestos-containing soils (ACSs), metals and hydrocarbons in Made Ground	Direct exposure, inhalation or ingestion of contaminated soils or dust	Construction workers	Low Likelihood	Minor	Very Low	Appropriate PPE for construction workers readily mitigate risk during basement excavations	-
			Future site residents	Low Likelihood	Severe	High	Limited potential for exposure as all Made Ground will be removed to form basement. No action necessary.	-
		Vertical migration via leaching	Controlled waters (groundwater)	Low Likelihood	Minor	Very Low	Underlain by a Secondary A aquifer. Testing of Site soils to determine presence of contaminants.	Low
	Methane and carbon dioxide	Exposure to ground gas and potential for explosion/ asphyxiation	Construction workers	Unlikely	Medium	Low	No action necessary.	-
			Future site occupants	Unlikely	Medium	Low	No action necessary.	-

Table 3.5: Preliminary Ground Contamination Risk Assessment

4.0 SITE INVESTIGATION WORKS

Introduction

4.1 Ground investigations undertaken at the Site comprised the following:

- Initial investigation undertaken in July 2016 (Appendix H2);
- Further investigation undertaken in December 2023 to determine groundwater levels (Appendix H3); and
- Investigation to determine the nature and extent of the garden retaining walls in 2024 (Appendix H4).

4.2 A summary of the investigation undertaken are provided below with the reports provided in the appendices identified above and an overall exploratory hole location plan presented in Appendix H1.

Ground Investigation (July, 2016)

4.3 Site Investigation works comprising 2No. windowless sample boreholes (WS01 and WS02), a cable percussive borehole (BH01) and 2No. foundation inspection pits (TP01 and TP01A) were carried out between 31st May and 7th June 2016. The ground investigation report is presented in Appendix H2.

4.4 The purpose of the investigation was to confirm ground conditions at the Site and ascertain existing foundations at the property. Soil samples were obtained for laboratory analysis (chemical and geotechnical), monitoring standpipes were installed for the assessment of ground gas and to help determine groundwater levels at the Site.

4.5 Representative disturbed and bulk disturbed samples were taken from the boring tools at regular intervals throughout the depth of the borehole, with in-situ Standard Penetration Tests (SPTs) carried out at regular intervals.

4.6 On completion of the boreholes, ground gas/groundwater monitoring standpipes were installed to depths of between 7.0m and 13.0m bgl, with a response zone from the base of the hole to one metre below ground level, completed at surface with plain standpipe sealed with bentonite and secured at ground level with concrete and a gas tap installed.

Groundwater Investigation (December, 2023)

4.7 Following site demolition and lowering of ground levels across the Site, the window sampler boreholes installed in July 2016 ground investigation were lost. A further 3No. boreholes (WS101, WS102 and WS103) were installed across the Site. The aim of the investigation was to help determine standing groundwater levels at the Site, with monitoring undertaken during

the wetter winter months. An exploratory hole location plan is presented in Appendix H1. Exploratory hole logs are presented in Appendix H3. The results of the groundwater monitoring are summarised below.

Retaining Wall Investigation (August, 2024)

4.8 In order to determine the nature and extent including foundation profile of the garden retaining wall installed during prior demolition works, a series of 5No. hand pits (TP01, TP01A, TP02, TP03 and TP03A) were undertaken. Sketches detailing the findings of the investigation are presented in Appendix H4.

4.9 Additionally, to help determine the permeability of the Claygate Member, a bulk sample was taken for laboratory geotechnical testing (particle size distribution and falling head permeability).

Geotechnical Laboratory Work

4.10 The laboratory geotechnical test results are summarised below and presented in full in the ground investigation reports, Appendix H2 and Appendix H4.

4.11 The laboratory geotechnical testing comprised:

- 5No. moisture content tests;
- 5No. atterberg limit classification tests;
- 6No. particle size distribution tests;
- 1No. falling head permeability test;
- 3No. single stage triaxial compression tests; and
- 4No. BRE SD1 suite test (determination of aggressive ground to concrete).

4.12 The geotechnical laboratory certificates are included within the ground investigation report, Appendix H1 and are summarised in the 'Ground Conditions' section of this report below.

Ground Conditions

4.13 Encountered soil conditions recorded during the ground investigation are reported in the exploratory hole logs within Appendix H1, H2 and H3 and are summarised below.

<u>Made Ground</u>

4.14 Made Ground was recorded to depths of between 0.40m and greater than 1.20m. The Made Ground was generally described as: '*dark brown grey sandy gravel/gravelly sand*'. Anthropogenic material within the Made Ground comprised: concrete and brick A concrete obstruction was recorded at 1.10m during the formation of BH01A.

4.15 The Made Ground was underlain by soils considered to represent the Claygate Member and was found to comprise interbedded sequences of both cohesive and granular horizons.

Claygate Member

4.16 The Made Ground was underlain by cohesive material to depths of between 2.20m and 4.50m bgl (109.92m to 107.58m aOD) and were generally described as: '*firm mottled brown grey and orange slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium flint*'. 3No. in-situ strength tests (SPTs) were undertaken within the cohesive horizons of the Claygate Member, recorded N-values in the range of N=8 to N=13, equating to material descriptions of soft to firm.

4.17 Additional cohesive horizons were recorded between: 107.27m and 107.77m aOD; and 102.68m and 101.48m aOD.

4.18 Laboratory geotechnical tests undertaken on cohesive samples of the Claygate comprised: moisture content; plasticity and single stage triaxial tests, as summarise in Table 4.1, below.

Test	No. of Tests	Result Range
Moisture content	5	21% to 35%
Plasticity index	5	23% to 37% (CI to CH)
Apparent cohesion (UU triaxial compression)	3	48kN/m^2 to 88kN/m^2
Bulk density	3	1.88 Mg/m^3 to 1.99Mg/m^3
pH	1	5
Water soluble sulphate	1	0.06g/l

Table 4.1: Cohesive Claygate Member laboratory geotechnical test results

4.19 The laboratory geotechnical test results indicate the cohesive horizons of the Claygate Member comprise a silty clay/clayey silt.

Granular Claygate Member

4.20 The granular horizons (sand and silt) were recorded to depths in excess of 6.60m and 9.40m bgl (105.52m to 102.68m aOD) and generally described as: '*loose to medium dense yellow brown grey silty fine sand*' and '*grey sandy SILT. With very thin layers (,50mm) of soft to form silty clay*'.

4.21 Geotechnical laboratory test results from the granular Claygate Member are presented in full in Appendix H4, and are summarised in Table 4.2, below.

Test	No. of Tests		Result Range
Particle size distribution	6	Fines <0.063µm	17% to 31.7%
		Sand 0.063µm to 2mm	68.3% to 82%
		Gravel	4%
Permeability test	1		3.2E-09m/sec

Table 4.2: Granular Claygate Member laboratory geotechnical test results

4.22 The laboratory geotechnical test results confirm the material descriptions of 'silty sand', recording a high percentage of fines within granular horizons of the Claygate Member. The permeability test indicates the granular Claygate Member is of low permeability.

Groundwater

4.23 During exploratory hole formation, groundwater strikes were recorded at depths of between 44.30m and 4.70m bgl (107.8m and 107.4m aOD), rising to depths of between 4.30m and 3.72m bgl (107.8m and 108.43m aOD) after 20 minutes. Subsequent monitoring of installed standpipes in 2016 and with newly installed wells in 2023 (see Appendix H) recorded groundwater at levels of between 108.79m aOD and 109.5m aOD. Table 4.3, below, summarises groundwater monitoring undertaken at the Site.

Monitoring Point	Date	Groundwater (m aOD)	Groundwater (m bgl)
BH01	June 2016	109.08	3.22
	July 2016	-	
	21/12/2023	109.24	3.06
	18/01/2023	109.28	3.02
	10/06/2024	108.82	3.48
	04/09/2024	108.88	3.42
	25/09/2024	108.86	3.44
WS01	June 2016	108.92	3.38
	July 2016	108.92	3.38
WS02	June 2016	109.1	3.2
	July 2016	109.1	3.2
WS101	21/12/2023	109.3	3
	18/01/2023	*	
	10/06/2024	108.99	3.31
	04/09/2024	108.79	3.51
	25/09/2024	109.03	3.27
WS102	21/12/2023	109.47	2.83
	18/01/2023	109.39	2.91
	10/06/2024	109.34	2.96
	04/09/2024	**	
	25/09/2024	**	
WS103	21/12/2023	109.34	2.96

Monitoring Point	Date	Groundwater (m aOD)	Groundwater (m bgl)
	18/01/2023	109.27	3.03
	10/06/2024	109.06	3.24
	04/09/2024	109.11	3.19
	25/09/2024	109.08	3.22

Table 4.3: Summary of Site groundwater monitoring

*No access – monitoring point was below frozen water/**position silted up

4.24 Groundwater monitoring was initially undertaken during the summer months of 2016 and then in the winter of 2023/2024, with one final visit undertaken in June 2024. Recorded levels were between 109.50m and 108.82m aOD, with an average level of 109.1m aOD. The groundwater monitoring results have been relatively consistent over time, with a variation in levels of between 0.28m and 0.68m.

4.25 The results from Table 4.3 are presented graphically in Figure 4.1, below.

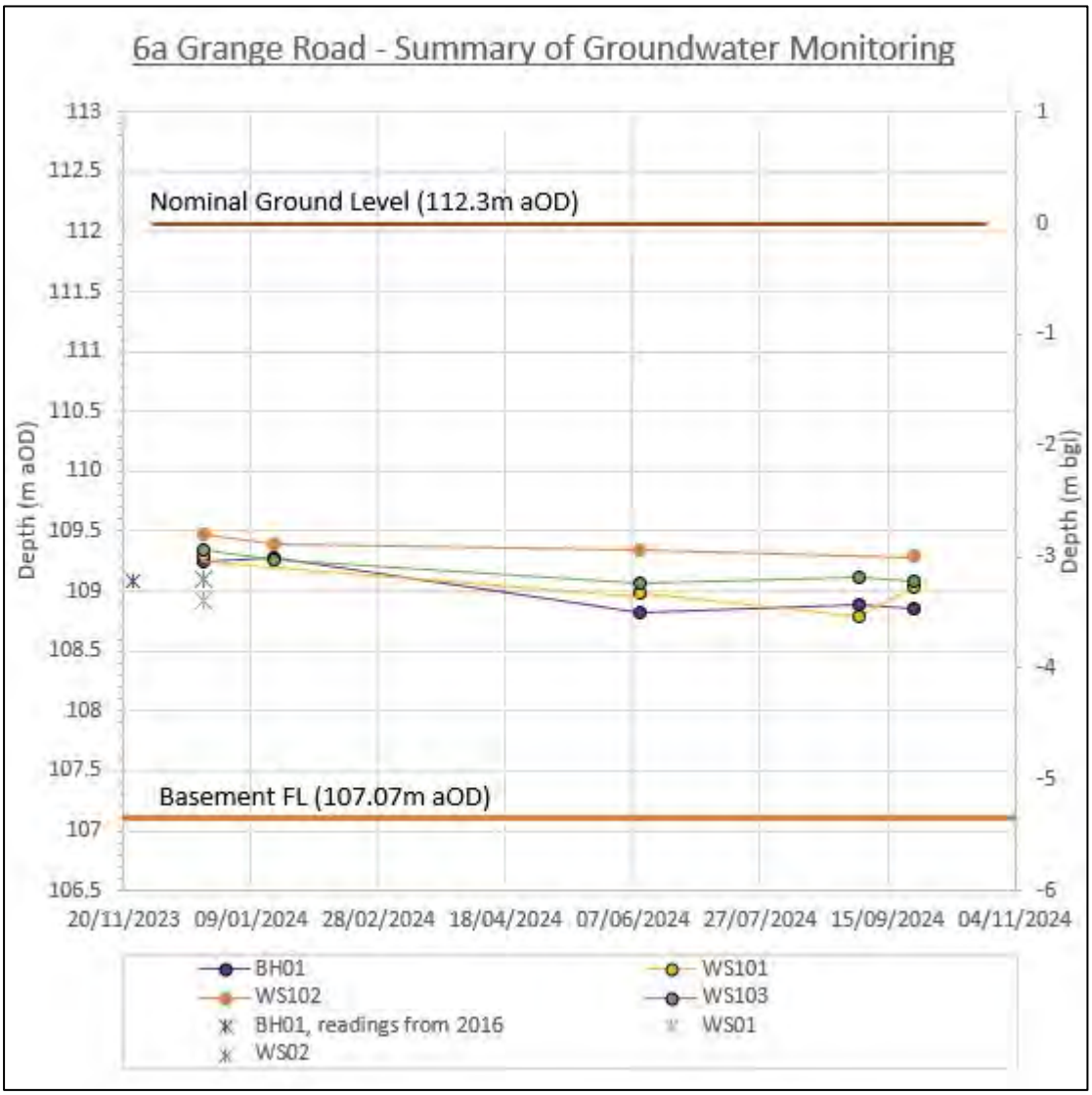


Figure 4.1: Graphical representation of groundwater levels

4.26 The recorded levels are broadly in line with those recorded at No.8 Grange Road, which recorded groundwater at levels of between 3.54m and 3.98m bgl, indicating a seasonal variation of 370mm.

Garden Retaining Wall

4.27 The top of garden retaining wall, as detailed in the topographic survey (Appendix B) is located at an elevation of between 111.89 and 111.96m aOD. The structure of the retaining walls were determined through site investigation and the results are illustrated in Appendix H4.

4.28 The wall to the north of the Site was recorded to be 2.36m deep with a 200mm footing 2.24m in length to the south. The footing was at an elevation of between at between 109.65 to 109.45m aOD. The wall to the south was confirmed to be 2.52m deep (109.43m aOD) with no footing. The wall to the west, at the rear of the garden, was confirmed to be 2.46m deep (109.50m aOD) with a footing to the west 450m deep; 200m wide and 560m deep at an elevation of between 111.56 and 111.00m aOD.

4.29 Groundwater levels below the site were measured between 108.82 and 109.50 m aOD, so the retaining walls in the gardens predominantly lie above the water table with negligible impact on groundwater flow.

5.0 GEOLOGICAL INTERPRETATION AND GEOTECHNICAL DESIGN PARAMETERS

Ground Model

5.1 Ground conditions at the Site comprise Made Ground to depths of 111.80m aOD (0.5m bgl), underlain by cohesive soils of the Claygate Member to approximately 110.3m aOD (2.0m bgl), underlain by granular horizons of the Claygate Member to the maximum depth of the boreholes, 98.88m aOD (13.2m bgl). Cohesive bands were recorded within the granular Claygate Member.

5.2 Monitored groundwater levels were recorded at depths of between 109.5m and 108.8m aOD. However, for the purposes of design, a level of 109.34m aOD has been used.

5.3 Based on the borehole logs, geotechnical laboratory test results and geotechnical plots (Appendix H5), the following ground model (with material design parameters), has been derived, as detailed within Table 5.1.

Parameter	Made Ground	Claygate cohesive	Claygate granular
Stratum base	111.8m aOD	110.3m aOD	>102.7m aOD
Stratum thickness	0.5m	1.50m	>9.4m
Stratum type	Granular	Cohesive	Granular
Unit weight (Y)	18kN/m^3	19kN/m^3	20kN/ m^3
Cohesion	-	40kN/m^2	-
Angle of shearing resistance (Φ)	-	24°	30°
Young's Modulus (E)	10,000	17,500	22,000
Groundwater	109.34m aOD		

Table 5.1: Material Design Parameters

Pile Capacities

5.4 The vertical pile bearing capacity for both secant piled basement embedded retaining wall and interna load beating piles supporting the superstructure has been calculated using the ground material properties derive above.

5.5 Based on the ground conditions encountered and the proposed development, a Continuous Flight Auger (CFA) piled solution is recommended. Resistance properties above basement formation level (107.07 m aOD) have been ignored.

5.6 Factors of safety applied to assessment of piled foundations:

- Base $\Upsilon_b = 2.5$
- Shaft $\Upsilon_s = 3$

5.7 Pile resistance (R) is calculated by the combined resistance from the pile shaft and pile base:
$R = Q_{bu} + Q_{su}$

Base Resistance: Q_{bu}

5.8 The base resistance is calculated by:

$$Q_{bu} = [A_p(N_q\sigma_q)]/\gamma_b$$

5.9 Where:

- A_p is the pile cross-sectional area;
- σ_q is the effective vertical stress;
- γ is the effective density of rock mass; and
- N_q is a bearing capacity factors.

Shaft Resistance: Q_{su}

5.10 Shaft resistance is calculated by:

$$Q_{su} = (\pi.D_0.\tau_{int}.d_z)/\gamma_s$$

5.11 Where:

- D_0 is the pile width;
- τ_{int} is the interface shear strength; and
- d_z is the length of pile interacting with strata

Shaft Resistance: q_{su}

5.12 Shaft resistances within the overburden are calculated by:

$$\boldsymbol{q_{su} = (\pi D_0.\tau_{int}.dz)/\gamma_s}$$

- πD_0 is the surface area of the pile within the overburden
- τ_{int} is the shaft friction
- d_z is the length of the pile within the overburden

Settlement

5.13 Pile settlements were calculated by the Randolph and Wroth method:

$S_b = \frac{4T_{bi}D_0I_{si}}{\pi D_0^2 2G(1+\upsilon)}$ where:

- S_b = pile settlement
- T_{bi} = is pile load
- I_{si} = influence factor
- D_0 = pile diameter
- v = Poissons Ratio of soil

5.14 Using the above formulae, a single CFA pile will provide the following pile resistances, as detailed in Table 5.2, below.

Length	9.70m	11.0m	9.70m
Diameter	450mm		600mm
Base Resistance (Q_{bu})	119kN	131kN	211kN
Shaft Resistance (Q_{su})	44kN	61kN	59kN
Total Pile Resistance	**163kN**	**192kN**	**270kN**
Settlement	12mm	14mm	15mm

Table 5.2: Pile resistances

Heave

5.15 Cohesive soils are indicated to approximately 2.0m bgl, underlain by granular material albeit, with cohesive horizons, the shallowest of which was recorded at a depth of 105.5m aOD. At 1.57m below the basement formation level, this c. 600mm thick clay layer will have minimal impact upon basement construction.

5.16 The proposed development will include the removal of 3No. Goat Willows, detailed as tree T011 within the Sie-specific Arboricultural Report (Appendix E). The Goat Willows are two metres high and indicated to be of high water demand. Site soils comprise medium to high plasticity clay. However, at a distance of 8.10m to the rear of No.8 Grange Road, the foundations are outside the zone of influence from these trees and their removal will have no impact on the adjacent property foundations.

Buried Concrete

5.17 Design/mix of buried concrete should be undertaken in accordance with the appropriate ACEC classification, of BRE Special Digest 1: 2005 (Concrete in Aggressive Ground). On this basis the Site is deemed to classify as “greenfield” and on the basis of the Site history, the geological setting, and observations during the formation of exploratory holes, the Site is not considered to be one that may contain pyrite (i.e. sulphide).

5.18 A total of 3No. samples from the Claygate Member and 1No. water sample were subject to pH and SO4 analysis. Results indicate soluble sulphate concentrations in samples of 10mg/l to 270mg/l. Based on the low number of samples tested, the worst case of 270mg/l was used to calculate the Design Sulphate Class for the Site, which is considered to be “DS- 1”.

5.19 Based on the Site geology, the groundwater conditions can be described as ‘mobile’. Recorded pH values were in the range of 5 to 5.9. On this basis, the “Aggressive Chemical Environment for Concrete (ACEC)” class for concrete in the ground is indicated to be AC-2z. Design/mix of buried concrete should be undertaken in accordance with these classifications.

6.0 HYDROGEOLOGICAL CONCEPTUAL SITE MODEL

Introduction

6.1 The information and data summarised in the earlier sections of this report has been used to produce a Hydrogeological Conceptual Site Model (HCSM) that has been used as the basis for the subsequent appraisals presented in the further sections of this report.

Catchment Data

6.2 Reference to the Environment Agency Catchment Data Explorer confirms that the site is within the surface water catchment of the Dollis Brook and Upper Brent Water Body.

6.3 The Site covers an area of approximately 0.04 hectares (430m^2) which is approximately 1E-06% of the catchment area (43.083km^2) for the Dollis Brook and Upper Brent Water Body.

6.4 Reference to available mapping suggests that the nearest known surface water course to the site is a stream located on Highgate golf course approximately 650m northwest and is believed to form a tributary to Mutton Brook which flows in a westerly direction before forming a confluence with Dollis Brook and joining the River Brent.

Infiltration & Groundwater Recharge

6.5 Based on the current understanding of the on-site conditions, the HCSM predicts that recharge across the site will vary according to the ground cover and unsaturated zone geology. At present the site comprises a plot of vacant land but was previously occupied by a residential property with rear garden area.

6.6 Following development, the proportions of hard surfacing will increase slightly and the proportions of soft surfacing will decrease slightly compared to the previous residential dwelling.

6.7 In the areas of soft ground cover, rainfall infiltration will be controlled by the Soil Moisture Deficit (SMD) and rates of evapotranspiration. In areas of hard cover, rates of run-off will be high and rainfall infiltration will be limited to localised cracks in hard standing and inputs from artificial mechanisms such as leaking drains (assumed to be 80% efficient).

6.8 It is likely that following development, infiltration via leakage will decrease as the quality of the hard cover and drainage networks will improve.

6.9 The areas of proposed soft cover comprise a mixture of grass, trees and shrubs. As such, it is considered likely that evapotranspiration and the SMD are the major controlling factors and

that direct rainfall recharge of groundwater beneath the site will be relatively low. It is anticipated that this recharge mechanism will only be significant in the winter months.

6.10 There is potential for local recharge of the groundwater beneath the site via off-site areas where soft ground cover is present and prevalent, such as the rear gardens in the surrounding residential housing.

6.11 However, given the sub-urban setting of the site, over the wider area the principal zone of recharge is considered to be where the Claygate Member and Bagshot Formation outcrops at or near surface in areas of soft cover (woodland etc) to the east-southeast of the site. This would also be limited by the extent (outcrop), geological heterogeneities and hydraulic continuity of any groundwater units (e.g. leakage from the Bagshot Formation into the underlying Claygate Member). This will not alter as a result of the proposed development.

Groundwater Conditions

Hydrogeological Overview

6.12 As outlined, the site is located over the Claygate Member which is designated a Secondary (A) Aquifer. Reference to the BGS lexicon suggests that the Claygate Member typically comprises a sequence of clay with sand laminae and grading into silt, clay and silty fine sand units. The groundwater bearing sections of the sequence are typically within the more sandy layers which tend to be confined by intervening relatively lower permeable more cohesive layers, resulting in a multi-layer aquifer system.

Interpreted Conditions

6.13 The ground and groundwater conditions encountered during the site-specific ground investigation works are consistent with the BGS descriptions with typically a sequence of sandy Clay overlying silty fine Sand and silty Clay, sandy Clay and sandy Silt recorded.

6.14 During the 2016 ground investigation works, groundwater strikes were recorded in all three locations (BH01, WS01 & WS02) at similar elevations, with groundwater rising relative to the strike elevation. During the 2024 ground investigation works no groundwater strikes were recorded.

6.15 The observations suggests that groundwater within the Claygate Member beneath the site is confined i.e. the recorded groundwater levels represent the piezometric level.

6.16 As outlined, during return monitoring groundwater was recorded in all locations within the Claygate Member. The groundwater elevation was generally recorded within a silty fine Sand unit underlying a sandy Clay unit which is interpreted to act as a confining layer, although localised clay bands within the silty fine Sand unit could also act as confining layers.

6.17 The formation level of the new basement level is at approximately 107.07m aOD which places it on the groundwater bearing silty fine Sand unit.

6.18 Based on the site-specific ground investigation data the interpreted silty fine Sand aquifer unit within the Claygate Member varies in thickness between approximately 4.0m and 7.0m, the base interpreted to be marked by a silty and sandy Clay unit (top recorded at c. 102.68 and 104.25m aOD) and estimated to be at least 1.0m in thickness.

6.19 As detailed in Section 5, groundwater flow will follow the general contours of the land: southeast to northwest in the vicinity of the Site, see interpreted groundwater flow diagram, Appendix I.

Groundwater – Surface Water Interactions

6.20 As outlined, the nearest known surface water feature is a tributary of Mutton Brook located approximately 650m north west of the site. This is close to the junction of the outcrop of the Claygate Member and underlying London Clay Formation and is likely to reflect the natural spring line near the base of the Claygate Member.

Appraisal of Basement Impact on Local Groundwater Conditions

General Appraisal of Impact

6.21 Based on Figure 6.1 (ref. ARUP Lambeth Residential Basement Study) and local basements, as detailed within the groundwater flow diagram (Appendix I), scenario B (intermittent basements) best represents 6a Grange Road and surrounding area.

6.22 The cumulative effect - if any - of several underground developments in a given street could potentially differ from the impact of the first basement. It is, therefore, appropriate to consider whether the layout and proximity of multiple basement schemes is important, especially any adjacent neighbouring schemes. Groundwater flows through the gaps between basement structures and is prevented from passing beneath the houses with new basements. The effects are an increase in groundwater levels up hydraulic gradient of the structures, and a decrease down hydraulic gradient.

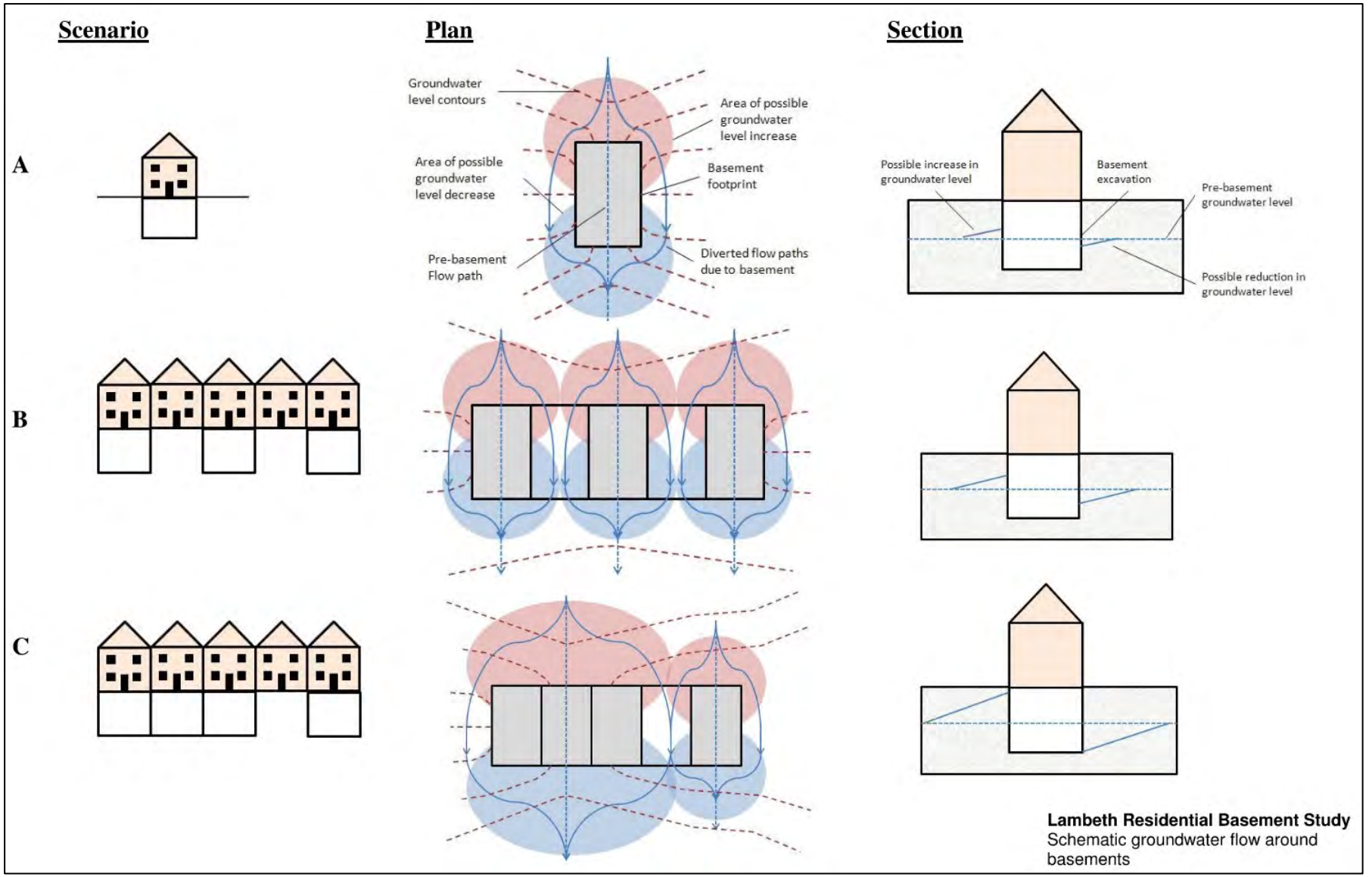


Figure 6.1: Groundwater flow around basements (Source: AURP Lambeth Residential Basement Study, 2016)

6.23 However, according to ARUP (2016), the disturbance is less than might be expected. For hydraulic cut-off structures such as sheet piles, the purpose of which is to form a barrier to groundwater flow, it has been shown that a 90% reduction in the cross-sectional area reduces the rate seepage by only about 60%. In the notional case shown in Figure 6.1, the space remaining open between buildings, as a proportion of the original flow channel, is approximately 40%. On the basis of the work referenced above, it is apparent that the reduction in flow through the gap will be considerably less than the reduction in width of the flow channel. The flow velocity through the narrowed channel will be slightly higher than before. The higher flow velocity is due to the increased hydraulic gradient resulting from the rise in water levels up hydraulic gradient and lowering down hydraulic gradient of the row of basements.

6.24 The extent to which the cumulative effects of basements may impact groundwater flow and levels will depend on the properties of the aquifer materials. In highly permeable formations groundwater flow can easily be diverted around basements, ultimately leading to a groundwater level increase up hydraulic gradient, less than would be seen for less permeable materials. Particle Size Distribution (PSD) testing of the Claygate Member soils beneath the Site indicate a 43% silt and clay content with a very low permeability ($3.2x10^{-9}$m/sec), see Appendix H2. Consequently, groundwater flow rates will be slow and any change in up hydraulic gradient and down hydraulic gradient groundwater levels are likely to be minimal and well within the realms of normal seasonal variation.

Site Specific Appraisal of Impact

6.25 The basement development proposes the use of a secant pile wall installed to a depth of c. 101.30m aOD which will truncate the silty fine Sand aquifer unit within the Claygate Member.

6.26 Groundwater flow is interpreted to be in a north westerly direction and so the proposed basement structure is approximately perpendicular to the interpreted groundwater flow within the Claygate Member.

6.27 On this basis it has been concluded that the basement development will result in a localised increase in the hydraulic gradient and groundwater elevation immediately up hydraulic gradient of the site and new basement structure.

6.28 In order to appraise the potential localised increase in hydraulic gradient and groundwater elevation the approach has been to estimate the current groundwater flow pre-development based on a cross-sectional area of aquifer of 220m^2 (40m site length x 4.0-7.0m aquifer thickness) and then applying that flow rate, assess the increase in hydraulic gradient resulting from the reduction in the cross-sectional area of aquifer to c. 110m^2 (40m basement length x remaining 4.0-7.0m aquifer thickness) following basement construction. A site-specific falling head test has been used to derive a hydraulic conductivity value that has been used as the basis for a range of values (K) from 0.13m/d to 2.0m/d. The hydraulic gradient has been

estimated from the groundwater monitoring data at between 0.05 and 0.07. The range is relatively high and possibly indicative of discrete groundwater units but has been applied over the whole aquifer unit to add conservatism.

6.29 In reality, the above scenario is overly conservative as the extent of the aquifer unit is not limited to the site and so the appraisal has also assessed the increase in hydraulic gradient based on a 100m length of aquifer perpendicular to the site.

6.30 The worksheet used for the scoping appraisal is provided in Appendix J and the results are summarised in Table 6.1, below:

Scenario	Estimated Hydraulic Gradient Post Development	Estimated Increase in Groundwater Elevation (mm)
Applying Site Dimensions	0.10 – 0.14	250 – 350
Applying 100m Length perpendicular to Site.	0.06 – 0.09	63 – 89

Table 6.1: Summary of Potential Groundwater Rise Calculations

6.31 It is important to note that that the appraisal has been undertaken to demonstrate a possible worst case (250-350mm) and more likely (63-89mm) range of increases in groundwater elevation for planning purposes and is intended as a guide and not presented as exact values.

6.32 Site groundwater is at a level of 109.34m aOD, with the foundations of No.8 Grange Road at a level of 111.52m aOD, a difference of 2.18m. Therefore, this appraisal indicates the proposed basement development will not result in a groundwater related impact on substructures and foundations connected to neighbouring properties.

Appraisal of Dewatering Within Basement Box

6.33 As outlined, the secant pile wall will extend to approximately 101.3m aOD and based on the available site-specific ground investigation data will terminate on soils comprising sandy Silt with clay bands.

6.34 The highest recorded groundwater elevation range is 109.39m – 109.08m aOD and this suggests a resultant head of groundwater above the basement formation level (107.07m) of between 2.32m and 2.01m.

6.35 The approximate volume of soil to dewater would be approximately (20x10x2.27m) 454m^3. Assuming a porosity of 20% in the saturated silty fine Sand soils this would suggest a volume to be dewatered within the basement box of c. 91m^3. All dewatering would be within the basement box and (although the final method would be the choice of the contractor) for the volume of water anticipated it is most likely that this would be undertaken by pumping from sumps as the excavation progresses.

6.36 Following installation of the secant pile wall there would be no horizontal groundwater flow into the basement excavation (via the silty fine Sand aquifer unit) and the potential for vertical groundwater flow would be limited by the presence of the cohesive unit (top recorded at between c. 102.68 and 104.25m aOD) which is conservatively estimated to be c. 1.0m in thickness. Therefore, drawdown of groundwater within the silty fine Sand aquifer unit above the cohesive layer would be limited to the basement box with no zone of influence outside the secant pile wall.

6.37 Based on the available ground investigation data the soils beneath the cohesive unit (top c. 102.68 and 104.25m aOD) comprise sandy Silt with clay bands and no groundwater strikes were recorded within these soils. Although it is acknowledged that there are likely to be further confined groundwater bearing units in these soils below the cohesive unit, any hydraulic connection with the groundwater within the basement excavation is interpreted to be very limited.

6.38 In summary, the anticipated dewatering to enable the basement excavation is not interpreted to result in a significant alteration to the groundwater levels externally.

6.39 Notwithstanding the above conclusions, reference has been made to the following document:

- Environment Agency (ref. SC040020/SR1, dated 2007). Hydrogeological Impact Appraisal for Dewatering Abstractions

6.40 This document is aimed at potential impacts resulting from dewatering abstractions on the local and wider hydrogeological environment. It includes a basic semi-quantitative method for assessing potential hydraulic resistance and vertical leakage across multi-layered systems.

6.41 This has been applied to the subject site by appraising the following three layers:

- Layer 1: silty fine Sand aquifer above the cohesive unit.
- Layer 2: cohesive unit (top c. 102.68 and 104.25m aOD).
- Layer 3: sandy Silt below the cohesive unit.

6.42 The worksheet used for the scoping appraisal is provided in Appendix J and the results are summarised in Table 6.2, below:

Layer	Estimated Hydraulic Resistance (days)	Estimated Total Resistance (days)	Estimated Vertical Leakage (m/d)
1	2.4	103.4	0.098
2	100		
3	1		

Table 6.2: Dewatering Summary of Potential Groundwater Rise Calculations

6.43 It is acknowledged that there is potential for some upward leakage / vertical groundwater flow via the secant piles that could 'short circuit' the estimated hydraulic resistance. However, as a semi-quantitative sense check it is considered to support the conclusion that dewatering to enable the basement excavation is unlikely to result in a significant alteration to the groundwater levels externally.

Potential Impacts - Surface water flow and flooding

6.44 No significant flood risk constraints have been identified as part of this assessment.

6.45 However, as the development will increase the impermeable/drained area of the site relative to the baseline conditions, rainwater harvesting, planting of lightwells and green roofs have been incorporated into the scheme to minimize the impact of the proposed development on the receiving sewer network and neighbouring properties.

6.46 Opportunities to incorporate attenuation into the design of the surface water drainage network have been considered as part of the concept design and have been included in the on the outline foul and surface water layouts included in Appendix D. The drainage proposals will be developed further as part of the detailed design following consultation with Thames Water to ensure that no significant detrimental impacts will occur.

6.47 In addition, a number of residual flood risks typical of a development of this nature were highlighted in The Flood Risk Assessment and Drainage Strategy report (Ref: GB/VL/P22-2546/04, provided in Appendix D) along with appropriate measures which will require consideration as the design progresses. As long as the mitigation measures set out in this report are developed and incorporated into the detailed design, then the development will not increase the risk of flooding to the property or nearby properties from any source.

7.0 ENGINEERING DESIGN PROPOSALS

Introduction

7.1 The basement design, preliminary construction sequence and proposed construction methodology for the temporary and permanent works are summarised below. This is to be read in conjunction with the sketches provided in Appendix K. The commentary below identifies how this addresses the assessment of potential impacts.

7.2 The proposed redevelopment of the Site comprises:

- Construction of a new single-storey water-tight reinforced concrete basement over the area of the proposed building footprint, extending out under the rear garden;
- Construction of a new three-storey residence above part of the new basement; and
- The footprint of the basement and new three-storey building is set back from the neighbouring property, No. 8 Grange Road, to maintain the shared ground level side access to the rear of the properties.

Site Observations and Background

7.3 The original building at No. 6A was demolished as part of a previous development under different ownership and the site is vacant.

7.4 The original ground levels have been reduced across much of the site as part of the development by the previous owners. A working platform (piling mat) will need to be imported to raise ground levels to enable piling of the piled wall.

7.5 The shared access to No. 8 within the ownership boundary of No. 6A will need to be temporarily stopped-up whilst the work is undertaken. This will be reinstated on completion with the new building of 6A, set-back from No. 8.

7.6 The basement footprint in the north-east corner has been set back far enough from the mature tree in the northeast corner of the site so as not to negatively impact it.

Surveys and Consents

7.7 The proposed development falls within the scope of the Party Wall Act 1996, hence the neighbouring adjacent buildings to north and south of the site will be subject to Party Wall awards. The Party Wall Surveyor will serve necessary notices under the Act. As part of these Awards, a visual condition survey will be carried out of the site boundaries and of each immediately adjacent property, i.e. No. 6 and No. 8. This record will enable a comparative assessment, should it be considered that the works have resulted in any movement or damage to the neighbouring buildings. The Contractor will be required to provide the Party Wall

Surveyor with all the appropriate information (drawings, method statements, etc) covering the Works that are notifiable under the Act.

7.8 Engagement will be necessary with Thames Water and an application made for a licence to discharged water from the basement excavation during construction

Permanent Works

Substructure design

7.9 To maintain the shared ground level side access to the rear of the properties the footprint of the new three-storey building is set back 970mm, from the neighbouring property, No. 8 Grange Road refer to drawing No. 2546-CCE-XX-B1-DR-S-0111-P02. The access between the properties in the permanent condition is very slightly wider than it currently is. The existing ground level of the side access to the rear of the properties is 112.300m AOD and is reinstated at the same level in the permanent works.

7.10 The proposed basement construction comprises propped embedded reinforced concrete 450 mm diameter secant piled retaining wall, 250 mm thick water-tight reinforced concrete liner walls, 300mm thick reinforced concrete basement slab and 300 mm thick lower ground floor reinforced concrete slab to form the basement 'box', as illustrated in the engineering drawings provided in Appendix K. The basement section adjacent the neighbouring property No. 8 is shown in figure 7.1.

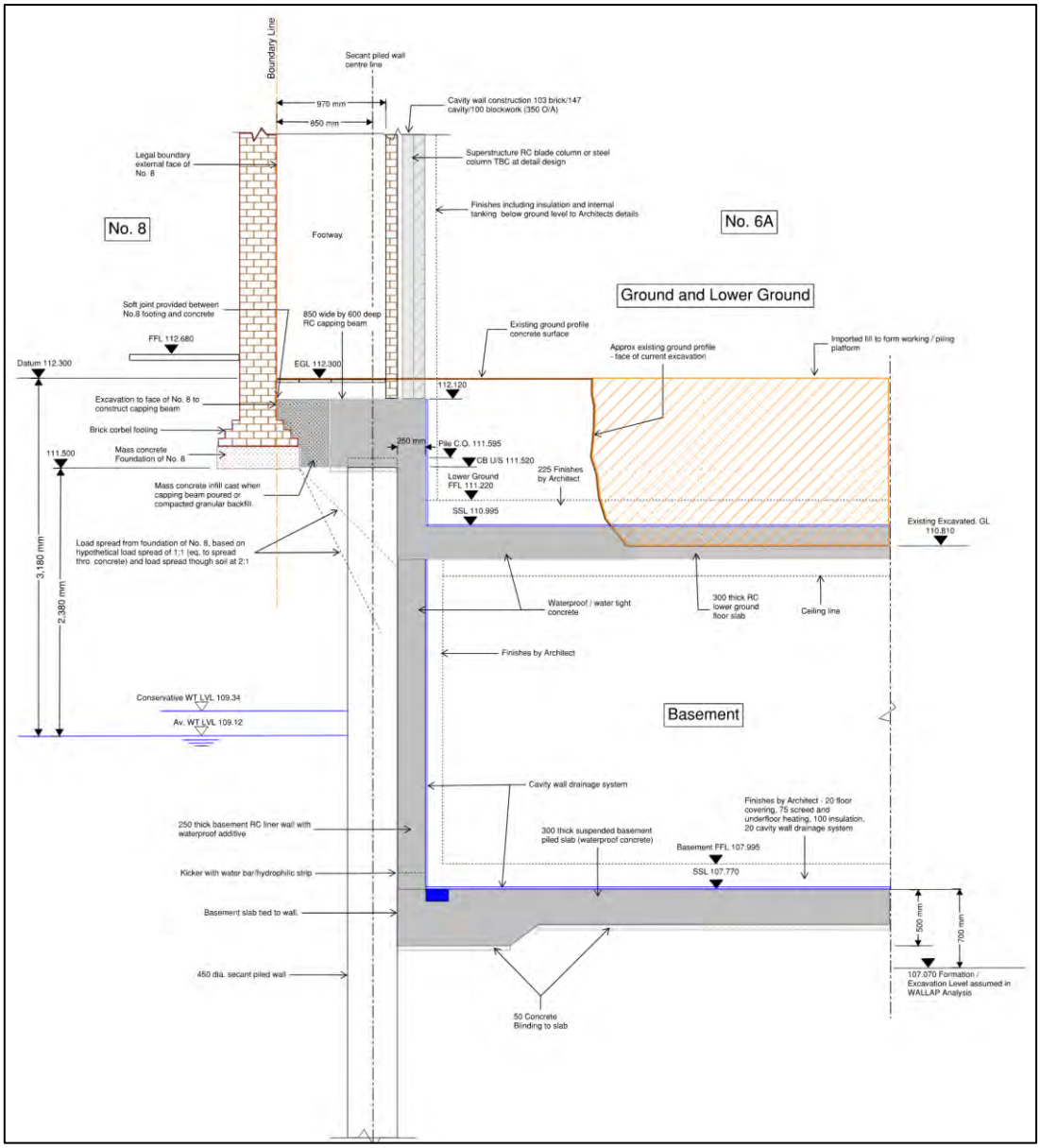


Figure 7.1 Part Basement Section Adjacent Property No. 8

7.11 The retaining wall analysis and assessment of ground movement within the surrounding area and design of the piled wall i.e. bending moments and prop forces has been completed by means of the geotechnical proprietary computer modelling software application WALLAP. This software is commonly used within the ground engineering industry and considered appropriate tool for this analysis.

7.12 The lower ground floor (LGF) structural slab level (SSL) is at 110.995m aOD and basement SSL is 107.770m aOD.

7.13 The neighbouring properties foundations at No. 8 and No. 6 apply surcharge load on the retaining basement piled wall. The surcharge load applied in the WALLAP modelling analysis for No. 8 Grange Road has been calculated based on a 7m high gable flank wall (measured from the survey drawings) of solid brickwork. The flank wall very conservatively is assumed to

be supporting a floor spanning 7.43 m and a ''all-in'' domestic floor load of 2.0kN/m^2 with timber roof (conservatively taken as 2.0 kN/m^2). The total load applied to the foundation equals 78kN/m run. A similar exercise was undertaken for No. 6 Grange Road. Surcharge loads used in the WALLAP analysis have conservatively been taken as 80kN/m run for No.8 Grange Road, 30kN/m at No.6 Grange Road (single storey extension) and 60kN/m run respectively. The width of the foundations is assumed to be 750 mm resulting in a surcharge applied in the model of 107kN/m^2 and 40kN/m^2 for Nos. 8 and 6, respectively.

7.14 The minimum length of the secant piled wall has been calculated based on the worse case of:

- Depth required below basement formation to cu-off groundwater flow from under and enable the basement box to be dewatered and allow excavation and construction;
- Geotechnical bearing capacity to support vertical load; and
- Required embedment length for the basement retaining wall rotational global stability.

7.15 Using a combination of WALLAP modelling analysis software and calculations for pile bearing capacity the minimum length of secant piled wall is determined for both geotechnical capacities to support vertical load and to achieve rotational stability. Th embedment length for rotational stability designed to limit potential damage to adjacent properties to Category 1 (see Appendix L). The pile length required to achieve the vertical bearing capacity is greater when located under a column position supporting the superstructure of the building than in the general case where there is no column and the wall supports only the basement and ground floor levels.

7.16 Under normal loading (applied from the basement and ground floor levels) the required embedment to achieve rotational stability is greater than the length required for bearing capacity. In this scenario the pile toe level is 102.62m AOD (4.45m below formation).

7.17 Where secant piles are required to support a superstructure column, to achieve the required bearing capacity the pile length is increased 1.32m to a toe level of 101.30 m AOD. These piles will be isolated small groups under superstructure column locations. Superstructure columns will typically be approximately 4m apart.

7.18 The longer pile lengths required for bearing capacity under columns theoretically increase the ground movement as a consequence of their installation. Therefore, the pile toe level adopted in the ground movement assessment (GMA) and damage assessment to property is based on these isolated deeper piles required to achieve bearing capacity with toe at 101.30 m aOD. The remaining piles in the general case can be installed to a depth of 102.62m aOD therefore reducing potential ground movement generally. The GMA based on the guidance of CIRIA 760 is for continuous piled walls. Therefore, by adopting a small number of isolated groups of longer piles for the GMA, the potential movement calculated is deemed conservative.

7.19 The proposed basement will interact with the groundwater with approximately 2.07 m head of water anticipated. The embedded secant piled perimeter wall is taken to sufficient depth below the basement formation level 102.62m aOD (101.30 m aOD at column locations) to control the flow of water entering the base of the excavation during construction. Combined with the interlocking secant piles to prevent horizontal ingress of groundwater, this allows groundwater within the basement to be pumped out and the basement material within excavated and basement constructed in the dry. There is no requirement locally to dewater the groundwater table and draw down of groundwater within the silty fine Sand aquifer unit above the cohesive layer. Dewatering would be limited to the basement box with no zone of influence outside the secant piled wall. The design, therefore, mitigates both groundwater ingress to allow construction and against potential for ground movement arising because of the extraction of groundwater. The Contractor is also required to ensure that the construction methodology and dewatering methodologies within the box structure are sufficient to control groundwater ingress and mitigate against potential ground movement. A detailed commentary and appraisal of 'dewatering' within the basement box is provided in Section 6.

7.20 Section 6 of this report deals with the site specific impact of the basement on groundwater flow. The groundwater is likely to flow from southeast to northwest in the vicinity of the Site. Groundwater is expected to flow around the basement without significant effects in the flow patterns, as it covers a relatively small part of the wider area. The increase in groundwater elevation on the upstream face caused by insertion of the basement structure and ''damming'' effect is calculated to be in the order of 63-89mm, which is less than the seasonal variation in groundwater level. This increase in elevated water levels will not impact on the neighbouring properties foundations, which are approx. 2.3m above this level.

7.21 The impact of the basement on groundwater flow does not warrant the need for mitigation measures such as drainage pipes or channels to prevent damming effects and standard basement construction techniques is proposed i.e. a waterproofed lined piled 'box'.

7.22 The Contractor will need to temporarily use a pumped system within the footprint of the basement box, as excavation proceeds, to control the flow of ground water into the basement excavation before the basement slab and perimeter walls are cast.

7.23 The embedded secant piled perimeter wall is taken to sufficient depth below the basement formation level to provide the required structural bearing capacity and combined with permanent and temporary props for global rotational stability at all stages against the depth of retained soil. The use of secant piles, therefore, allows construction of the basement without the potential to cause unacceptable damage to neighbouring properties.

7.24 The basement structure (walls and slabs) will be designed to comply with Grade 3 protection from groundwater in accordance with BS8102 for ventilated residential areas, providing two methods of protection, waterproof concrete and secondary cavity drain.

7.25 The 250mm thick reinforced concrete liner wall will provide the water-tight box using waterproof concrete additives, such as Caltite or Pudlo, this is combined with an internal drained cavity system provided as secondary protection. The wall design will allow for the appropriate depth of hydrostatic water pressure. Reinforcement in the walls and slabs will be designed to reduce crack widths from bending and cracking caused by restraint caused by shrinkage as the concrete dries-out.

7.26 Similarly, the 300 mm thick basement reinforced concrete slab at 107.770m aOD will be constructed using water-tight concrete with cavity drainage system secondary protection and the slab designed for upward hydrostatic water pressure. Subject to detail design, this may require the installation of tension piles within the footprint of the basement to support the slab against this buoyancy effect should this exceed the vertical gravity load. Tension piles will be reinforced with a central reinforcing bar with high factor of safety.

7.27 The RC suspended basement slab will be supported by and tied monolithically to the perimeter secant piled wall either with resin anchored dowel bars or dowel bars fixed to couplers cast-in the pile. The dowel bars will be fixed to the male hard piles. If necessary, a shear key in the form of a slot cut in the face of the piles, which the slab is cast in will be provided. Internally the slab is supported at slab thickening / pile caps for bearing piles, which also support superstructure over. The basement slab acts as a prop in the temporary and permanent cases. Based on the WALLAP analysis the maximum prop load into the basement slab is 116kN/m, which is less than a 30th of the capacity of the slab in compression, approx. 3,675kN/m and, therefore, is adequate for this purpose.

7.28 The vertical loads from construction of the three-storey structure above will be supported on the secant piled wall reinforced concrete capping beam and internal reinforced concrete walls and columns or steel frame.

7.29 The piled wall reinforced concrete capping beam will distribute vertical loads from the column and cladding into the piled wall below. The female piles are conservatively assumed to provide no bearing capacity to the piled wall. It is considered that the section of pile used to retain the basement wall will carry no capacity towards supporting the wall loads, therefore, the axial pile capacity is assumed from below formation level.

7.30 Proposed worse case loadings are based on a perimeter column supporting an internal area of the building 4.0m wide (half the building width) by 4.8m, a 200 mm thick RC flat slab at each floor, 1.5 kN/m^2 for finishes and services, domestic live load of 1.5 kN/m^2, and standard truss roof construction. The calculated unfactored column load applied to the capping beam on the piled wall will be approx. 430kN Service Limit State (SLS). Load directly applied to the capping beam from the cavity wall construction = 17 kN/m and the capping beam self-weight is equivalent to 12.8 kN/m. The total load associated with a column for distribution into piles is approx. 501 kN, but 525 kN is used in design. The capping beam is designed to spread load

over 4 piles (two piles each side of a column over a 2.4 m length of capping beam, 1.2m each side of the column).

7.31 Allowing for loads applied from the capping beam, cladding and column, the total vertical load from the superstructure into each pile below a column position will be 131 kN (SLS). The load from the 300 thick lower ground floor and basement slabs (including 75mm screed and finishes) equals 100 kN/m run equivalent to 60 kN per pile. Therefore, allowing for the lower ground and basement slab and structure above, the maximum total load in a single pile conservatively equals 191 kN.

7.32 The vertical load capacity of a single 450 dia. pile with toe at 101.30m aOD, which is 5.77m below formation level (pile capacity ignores the basement depth), is 192 kN which is greater than the 191kN applied load and is, therefore, adequate. Refer to Section 5.0 (Geological Interpretation & Geotechncla Deign Parameters) for pile capacity calculation. Note, the calculated vertical loads applied to the pile and the pile bearing capacity are both deemed conservative.

7.33 For a typical pile not supporting a column the applied load to the pile is 78kN against a capacity of 163 kN with pile toe depth at 102.62m aOD (192 kN with pile toe at 101.30m). This means the secant piles not supporting columns can be reduced in length with a toe level depth required for rotational stability of 102.62m aOD (pile capacity equals 163 kN).

7.34 The proposed development is lightly loaded (30 kN/m run) and thus vertical displacement on neighbouring structures will be negligible.

7.35 The lower ground level reinforced concrete slab will be constructed tied monolithically to the secant piled wall. The liner wall above this level will be tied to the slab and constructed monolithic with the capping beam i.e. partly hung from the capping beam for extra robustness. The lower ground slab will provide permanent propping action in the temporary and permanent case. Based on the WALLAP analysis the maximum propping force in the lower ground slab is 119 kN/m, which is less than the 3,675 kN/m compressive capacity of the 300mm thick slab.

7.36 It is proposed the basement will be excavated using top down techniques, allowing the superstructure to proceed at the same time. This form of construction is standard consisting of mini excavators lowered into the basement working below the ground slab and excavated spoil removed by grab through openings in the slab. With top down construction the ground floor slab provides both a temporary and permanent stiff prop near the surface reducing potential ground movement at the surface.

7.37 The initial excavation will be to the underside of the lower ground floor slab (above the water table and above the influence of the foundations from adjoining properties - refer to the engineering sections in Appendix L and figure 7.1). The lower ground floor slab will be cast as

a permanent prop acting as a plate across the basement. An opening will be formed in the lower ground slab (potentially using the stair opening as one aperture) to allow top down construction.

7.38 Plunge columns in piles installed after the secant piled wall construction will be used to support the lower ground floor slab. There is no ground movement impact from the installation of these piles within the installed secant piled wall perimeter wall above the piled wall toe level. If internal piles extend beyond this level there will be negligible impact caused by installation of a single pile located approximately 5m from the neighbouring property.

7.39 To limit settlement of adjacent ground and address temporary stability horizontal temporary propping will be required in advance of the permanent design. This is assumed to consist of walers and horizontal steel props at approx. basement mid-height. The free-body diagram provided in Figure 7.2 below shows the proposed construction sequence and prop location used in the computer modelling software programme WALLAP for the Ground Movement Assessment (GMA).

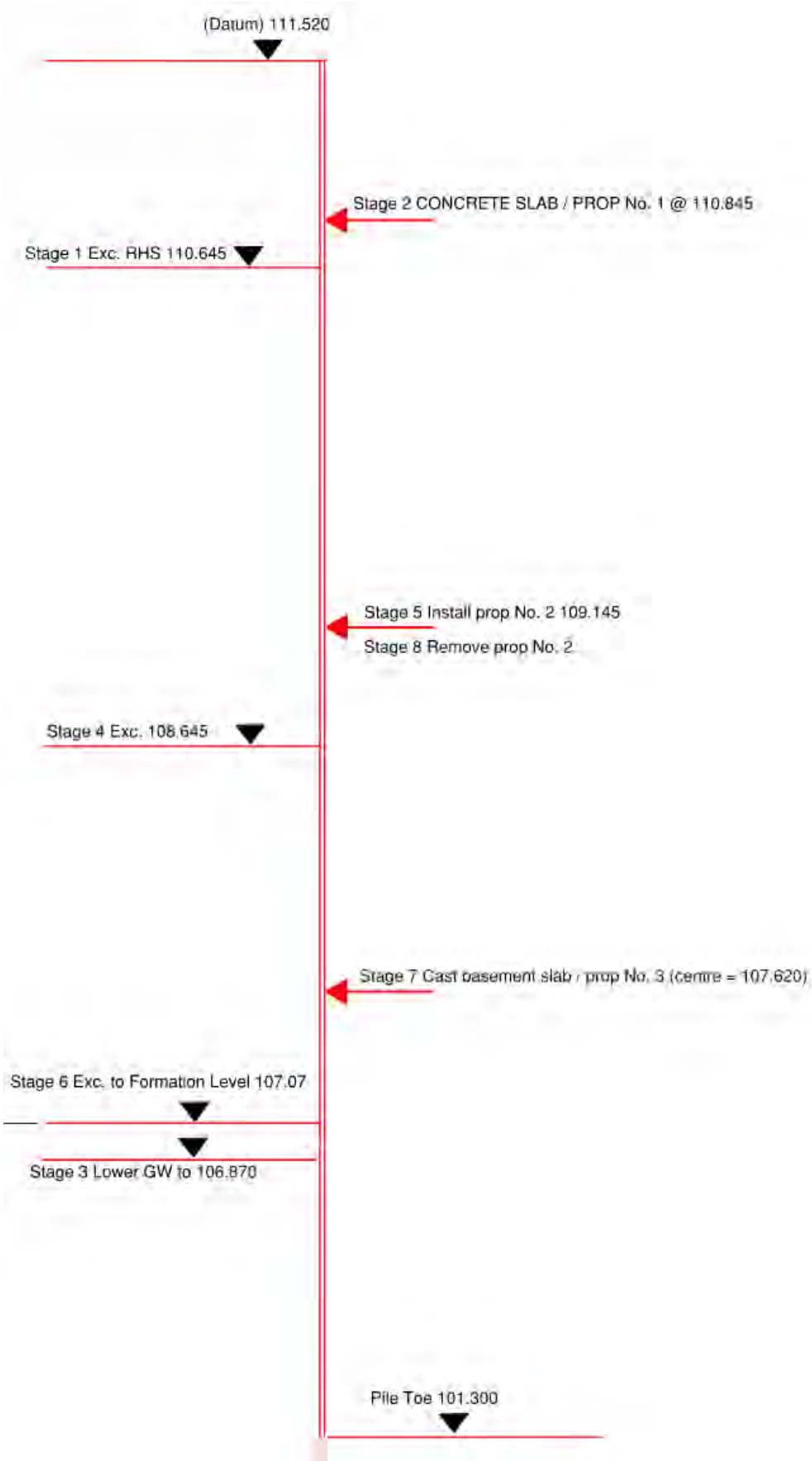


Figure 7.2: Free-body diagram of embedded propped secant piled retaining wall showing temporary and permanent props

7.40 The factored force applied to the temporary props based on the WALLAP analysis is 139 kN/m run. A Maybey heavy duty mechanical bracing strut has a capacity of 600 kN. The preliminary temporary bracing arrangement (ref. sketch 2546-CCE-XX-B1-DR-S-0112-P02 in Appendix K) shows struts at approx. 3.5 m centres, with an axial force of 487 kN. The chosen temporary works system and detail design is a Contractor design item. However, this demonstrates that temporary prop forces are within reasonable limits and can be accommodated using standard techniques during detail design by the Contractor's temporary works engineer.

7.41 The basement piled retaining wall and permanent slabs are designed to limit lateral displacement to within safe and acceptable limits of Category 1 damage (very slight), in accordance with the Burland scale, refer to calculations to this effect in Section 8.0, ground movement assessment, with calculations presented in Appendix L.

7.42 The maximum factored ultimate limit state (ULS) bending moment in the piled wall calculated using the specialist modelling computer software programme WALLAP for the general load case is 136 kNm/m, equivalent to 122 kNm/pile. For the deeper piles supporting columns the factored pile bending moment is 145 kNm.

7.43 Reinforced concrete circular column design charts were initially used to check the combined axial and bending structural capacity of the pile, however, because of the relatively low axial load (column load) compared to its axial capacity, the charts require the pile to be designed as a beam i.e. the interaction of pile load against pile moments fall within the zone of the chart ''design as a beam''.

7.44 For a 450mm diameter pile with 75mm concrete cover, 8mm diameter helical shear reinforcement and 8No. equally spaced H25 longitudinal reinforcement bars, the calculated bending capacity of the pile (conservatively assuming no axial load) is 152kNm. This is greater than the applied moment of 145 kNm and the typical pile bending moment of 122 kNm, thus the pile structural capacity is considered adequate.

7.45 Detailed structural design of the secant piled wall and temporary props are Contractor detail design elements post planning, however, the design undertaken confirm the pile and prop capacity are with reasonable limits with capacity exceeding demand.

7.46 The concrete mix for all concrete in the ground will comply with the requirements of the results of the chemical tests undertaken as part of the geotechnical site investigation (Appendix H2) in accordance with BRE Special Digest 1.

7.47 The design combined with a controlled construction sequence and temporary works designed to limit horizontal movements to comply with Category 1 (slight) damage in CIRIA C760 (classification of visible damage to walls after Burland) will minimise ground movement and potential damage to neighbouring properties.

Superstructure design

7.48 The lower ground floor is designed as a flat slab with plunge columns to suit.

7.49 The remainder of the superstructure is beyond the scope of this basement impact assessment but it is envisaged will consist of a reinforced concrete or steel framed building with either in situ flat slabs or for the steel framed option precast concrete slab system (hollow core) or metal deck and in situ concrete floors. External walls will either be brick masonry panels combined with an inner steel framing system (SFS) or infill masonry panels.

Construction Methodology, Sequence and Temporary Works

7.50 The outline construction sequence and temporary works assumed in the design and described in this report will be developed by the Contractor into their detail construction proposals.

7.51 The Construction sequence assumed is typical for constructing basements such as this and detailed on drawing 2546-CCE-XX-B1-DR-S-0125-P02 in Appendix K.

7.52 The sequence of construction to the basement is broadly described below.

7.53 Stage A – Enabling works:

- Secure site, erect hoardings, establish welfare facilities, divert services (temporary diversion of over-head telephone line to adjoining property);
- Party wall survey and condition survey of neighbouring properties;
- Install monitoring instruments;
- Temporary closure of side access shared with No. 8 within owners /site boundary; and
- Import fill to construct piling mat.

7.54 Stage B – Substructure (concurrently with Stage c):

- Construct perimeter secant piled wall guide / form;
- Construct secant piled wall from ground level around the perimeter of the basement/site;
- Construct load bearing piles and plunge columns for internal basement structure;
- Excavate ground on active left hand side between secant piled wall and the wall of No. 8 to underside of capping beam and blinding level. Ditto adjacent No. 6;
- Excavate ground on passive right hand side to underside of capping beam and blinding
- Cast capping beam;
- Excavate to underside of lower ground floor slab blinding;
- Cast lower ground floor reinforced concrete slab;
- Pump-out ground water within basement box as excavation proceeds;

- Simultaneously with top down construction, above lower ground level cast reinforced concrete (RC) liner wall against exposed secant piled wall and excavate basement to temporary prop level and install waler and prop;
- Complete excavation and cast blinding to underside of basement slab;
- Construct new reinforced concrete suspended basement slab and foundations (pile caps);
- Once basement slab is sealed and strength gained sufficient to resist hydraulic pressure dewatering within the basement slab by pumping can be stop and pumping sumps within basement slab sealed.
- Remove horizontal props and waler beams;
- Construct basement waterproof reinforced concrete (RC) liner wall against cleaned secant piles to underside of lower ground level; and
- Fitout basement;

7.55 Stage C – Superstructure, Externals and landscaping (concurrently with Stage B):

- Construct new structure above ground;
- Construct external drainage; and
- Landscaping.

Ground Monitoring Strategy - Proposals for Monitoring during Construction

7.56 The results of the ground movement analysis indicate damage to adjacent structures can be controlled to within Category 1 ''very slight damage''. It is proposed that a formal monitoring strategy is implemented on site to record and control ground movements during construction.

7.57 Monitoring of movement to check there are no undue settlements occurring as a consequence of the basement works to the adjacent properties at No. 6 and 8 will be undertaken.

7.58 Party walls will be visually inspected and significant existing cracking to party wall masonry monitored by attaching demec pins/tell-tails.

7.59 The monitoring system will operate broadly in accordance with the 'Observational Method' as defined in CIRIA Report 185. The following suggested preliminary monitoring method statement is intended as guidance to be fully developed by the Contractor (and specialist monitoring contractor),

7.60 It is envisaged monitoring will be undertaken by using positional surveys compared to baseline values established before any excavation work is undertaken on site. Regular monitoring of these positions will determine if any horizontal translation, tilt or differential settlement if the neighbouring structure is occurring as the construction progresses. Inclinometers will also be

placed and monitored within the selected secant piles around the perimeter of the basement excavation, as well as survey targets along the capping beam.

7.61 Monitoring data will be checked against predefined trigger limits based on the ground movement analysis (GMA) and can also be further analysed to assess and manage the damage category of the adjacent buildings as construction progresses.

7.62 Monitoring shall be carried out during construction at a frequency to be agreed with the Party Wall Surveyor(s) until the building works are complete (basement and superstructure). It is envisaged monitoring during the basement construction will be undertaken twice each week during construction of the basement box, and weekly once the basement permanent works relating to the retaining elements are complete. Thereafter, subject to the agreement of the party wall surveyor and depending on whether there has been significant unexpected movement recorded, monitoring can be monthly. If movement is recorded that is significantly greater than expected, then monitoring will continue fortnightly/weekly or more frequently (daily) if required.

7.63 Written results from monitoring shall be compared with the agreed limits using a traffic light system and reported to the basement structural engineer and relevant parties within 48 hours of measurements being taken.

7.64 The monitoring limits / trigger levels within the traffic light system are based on the (GMA) as follows:

- Green – In accordance with the movement predicted in the GMA
- Amber – 1.5 x predicated GMA movement
- Red – 2.0 x predicated GMA movement

7.65 The limitations on movement within the traffic light system are to be agreed with the Contractor, party wall surveyor and Engineer; however, we recommend it should follow a similar approach outlined in Table 7.1.

Traffic light	Movement Range mm	Action
Green	0 – 3.8	No action/Proceed
Amber	3.9 – 5.7	Investigate and review, consider implementing additional/greater construction control measures, increase frequency of monitoring.
Red	Greater than 7.6	Stop work to review and agree suitable and sufficient measures before starting work again.

Table 7.1: Monitoring Traffic Light Summary

8.0 GROUND MOVEMENT AND BUILDING DAMAGE ASSESSMENT

8.1 The insertion of piles to form the basement box and subsequent excavation of the basement box will result in ground movement, the effect of which reduces with distance, having the potential to impact upon adjacent structures.

8.2 Following the guidance of CIRIA 760 (C760), a ground movement assessment (GMA), provided in Appendix L was undertaken.

8.3 The Geosolve modelling computer software, WALLAP, was used to determine wall movements following excavation behind the piled secant wall. Results of software analysis were included within the GMA.

8.4 The side wall to No.8 Grange Road is 0.40m from the secant wall, foundation formation level has been taken as 1.36m bgl (111.52m aOD) with an estimated pressure 107kN/m^2. The building is 16m wide, approximately 8 metres high and has an internal wall at approximately 8.0m.

8.5 The single storey side extension to No.6 Grange Road is 0.60m from the secant wall, foundation formation level is taken as 0.38m bgl (110.86m aOD), with an estimated pressure 40 kN/m^2. The main building is at a distance of 3.54m from the proposed basement, with an assumed bearing pressure of 60 kN/m^2. No.6 Grange Road is 14m wide, approximately 7.5m high.

8.6 The basement box will be formed by means of a secant pile wall, with pile toe depth at 11.0m bgl (101.3m aOD).

8.7 Following pile insertion, the ground floor slab will be formed and the methodology of top-down construction followed with a 300mm allowance for overdig, basement formation level was taken at 5.23m bgl (107.07m aOD).

8.8 The WALLAP software was used to analyse ground movements as a result of basement excavation, with the following parameters used:

- Soil and groundwater parameters, as per the ground model;
- Wall Young's Modulus of 3+E07 kN/m^2 and moment of inertia of 3.35E-03 m^4/m run, with wall strength reduced to 70% in the short term following wall insertion and then to 50% of initial strength in the long term following excavation, forming of basement slab and removal of temporary propping;
- Surcharges as per foundation pressures from adjacent structures;
- Temporary propping was modelled using an equivalent Young's Modulus of 50,000kN/m^2;
- The ground floor slab and basement slab were modelled using a Young's Modulus of 3.0E+07; and

- Factors of safety were by means of the 'strength factor method', where soil values (tan phi and cohesion) are reduced and to service limit state (SLS).

8.9 The construction sequences applied for the WALLAP analysis are detailed in Table 8.1, below.

Stage	Stage Description
1	Apply surcharge no.1 at elevation 111.52m
2	Change EI of wall to 70,350 kN.m^2/m run
	Allow wall to relax with new modulus value
3	Excavate to elevation 111.52m on LEFT side
4	Change EI of wall to 70,350 kN.m^2/m run
	Reset wall displacements to zero at this stage
5	Excavate to elevation 110.65m on RIGHT side
6	Install strut or anchor no.1 at elevation 110.84m
7	Apply water pressure profile no.1 (Mod. Conserv.)
8	Excavate to elevation 108.65m on RIGHT side
9	Install strut or anchor no.2 at elevation 109.15m
10	Excavate to elevation 107.07m on RIGHT side
11	Install strut or anchor no.3 at elevation 107.77m
12	Remove strut or anchor no.2 at elevation 109.15m
13	Change EI of wall to 50,250 kN.m^2/m run
	Allow wall to relax with new modulus value

Table 8.1: WALLAP stages of analysis

8.10 Categories of damage to buildings is described in CIRIA C760, these are summarised below in Table 8.2.

Category	Description
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can be easily treated during normal decoration (crack width <1mm).
2 (Slight)	Cracks easily filled, redecoration possibly required. Some repointing may be required externally (crack width <5mm).
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 (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

Table 8.2: Classification of visible damage to walls (reproduction of Table 2.5, CIRIA C760)

8.11 For No.8 Grange Road, a maximum vertical movement of 5.59mm and maximum horizontal movement of 4.82mm across the length of the building were calculated. The resultant strains imposed upon the building would result in a Burland Damage Category of 1 (very slight).

8.12 For No.6 Grange Road, a maximum vertical movement of 5.22mm and maximum horizontal movement of 4.05mm across the length of the building were calculated. The resultant strains imposed upon the building would result in a Burland Damage Category of 1 (very slight).

8.13 In summary, building damage to neighbouring properties is predicted to be restricted to fine cracks that can be easily treated during normal decoration.

8.14 Services within Grange Road would be subject to <5mm horizontal and vertical movement as a result of basement construction, which is considered to be negligible.

9.0 CONCLUSIONS

9.1 A Basement Impact Assessment has been carried out to consider impacts on structural stability to neighbouring buildings, other infrastructure including the adjacent highway having regard to local geological/hydrogeological conditions, and flood risk issues.

9.2 The assessment is based on a site inspection, a desktop study including a review of all available site investigation data from recent basement proposals in the locality and a site specific site investigation.

9.3 Based on our current understanding of the site setting, ground conditions and the proposed design, we do not envisage that the proposed development will result in material impacts on subterranean groundwater flow, surface water flow and flooding or ground conditions such as slope stability/structural damage to neighbouring property, as long as the mitigation measures are included within the detailed design of the temporary and permanent works.

9.4 The engineering design of the substructure and indicative construction method statements, both summarised earlier in this report will need to be developed as the design progresses in order to address the potential impacts identified by this assessment. The structural scheme prepared along with a construction methodology demonstrates that the proposals can be built safely by an experienced contractor with the right skills and care without significant detrimental effect on the adjacent properties and local hydrology.

9.5 A ground movement assessment has been completed for the proposed development and lateral strains as a result of ground movement have been calculated, with a damage rating of Burland Scale 1 (very slight) for No.6 and No.8 Grange Road.

9.6 The proposed development will be below measured groundwater levels, with proposed piles penetrating further within the underlying permeable strata. However, in the context of the local hydrogeological setting, the basement will present a localised 'obstruction' to groundwater flow, with small scale and localised increases in groundwater elevation predicted. The cumulative impact from isolated basements within the vicinity of the proposed development will not adversely impact groundwater flow within the underlying Claygate strata.

9.7 No significant sources of flooding have been identified as part of this study that warrant further consideration as part of a more detailed Flood Risk Assessment. A number of mitigation measures are recommended to address the low risk of groundwater flooding and residual risks of, surface water, public sewers, site drainage, and public and internal water supply pipe work/storage. These risks can be managed by the design of the site drainage, by regular inspection and maintenance of the public and private sewer and water supply network.

9.8 In order to minimise any negative environmental impacts to neighbouring residents associated with the construction process, all demolition and construction should be undertaken in accordance with the Considerate Constructors Scheme standards and the ICE demolition Protocol (www.ice.org,uk) and under a Construction Environmental Management Plan. Such work should also have regard to GLA's best practice guidance document 'The Control of Dust and Emissions from Construction SPG' (www.London.gov.uk).

9.9 The site is located within a Conservation Area and will require Conservation Area Consent. In addition, it is advised that a Construction Management Plan is also prepared to assist with the management and control of construction impacts on the environment and local residents.

10.0 REFERENCES

10.1 Highgate Neighbourhood Plan (Policy DH9). Adopted Version, 2017

10.2 Haringey Development Management DPD Policy DM18). Adopted July 2017

10.3 SLR Consulting Limited (2012), Hydrogeological Impact Assessment at 10 View Road, Highgate, London N6 4DB

10.4 Alan Baxter & Associates LLP (2014), Structural and Civil Engineering Notes and Basement Impact Assessment to Support the Planning Application for No.8 Grange Road, Highgate, N6 4AP

10.5 LBH Wembley (2014) Hydrological, Hydrogeological & Basement Impact Assessment No. 9 Grange Road, Harrison Varma Construction Ltd

10.6 Environment Agency Flood Maps – Available at: http://maps.environment-agency.gov.uk/wiyby/wiybyController (Accessed July 2015)

10.7 Haringey Council (2011) London Borough of Haringey Final Draft V2.0 Surface Water Management Plan, Haringey Council

10.8 JBA (2015) Haringey Council Strategic Flood Risk Assessment, Haringey Council

10.9 Haringey Council (2011) Haringey Council Preliminary Flood Risk Assessment, Haringey Council

10.10 British Geological Survey Geo Index – Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html (Accessed July 2015)

10.11 ARUP Lambeth Residential Basement Study, 2016

APPENDICES

APPENDIX A

Architectural Drawings

C

A

Walk-on obscured rooflights to basement

planting

External
Sunken Garden

Family
Room

Ground Floor Above

Gym

Bathroom

Wine
Cellar

Storage/
Plant

Home
Cinema

Utility

B

RPA Horse Chestnut (T008)

RPA Sycamore (T007)

C

A

B

width to match no. 6

Basement Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road		
Sheet No: P/100	Rev: B	Date: 30/04/2025
		Scale: 1:50 A1 / 1:100 A3
Title: Basement Floor Plan		

replacement tree
replacement tree
replacement tree
top face of existing retaining walls
replacement tree
replacement tree
top face of existing retaining walls
replacement tree
replacement tree
C
A
basement extends under landscaping
Walk-on obscured rooflights to basement
planting
External Sunken Garden
Dining
Kitchen
2018 Approved Ground Floor
fireplace
Lounge
B
Storage
openable, obscured glazing, cill >1.7m above IFFL
B
Bathroom
openable, obscured glazing, cill >1.7m above IFFL
RPA Sycamore (T007)
Ramp
RPA Horse Chestnut (T008)
fireplace
Formal Lounge
Double Height Space Above
Bootroom
Covered Porch
C
A
replacement tree
Existing driveway reinstated in same location
Cycle & Bin Store
width to match no. 6

Ground Floor Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Demolished building location	11/11/24
C	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

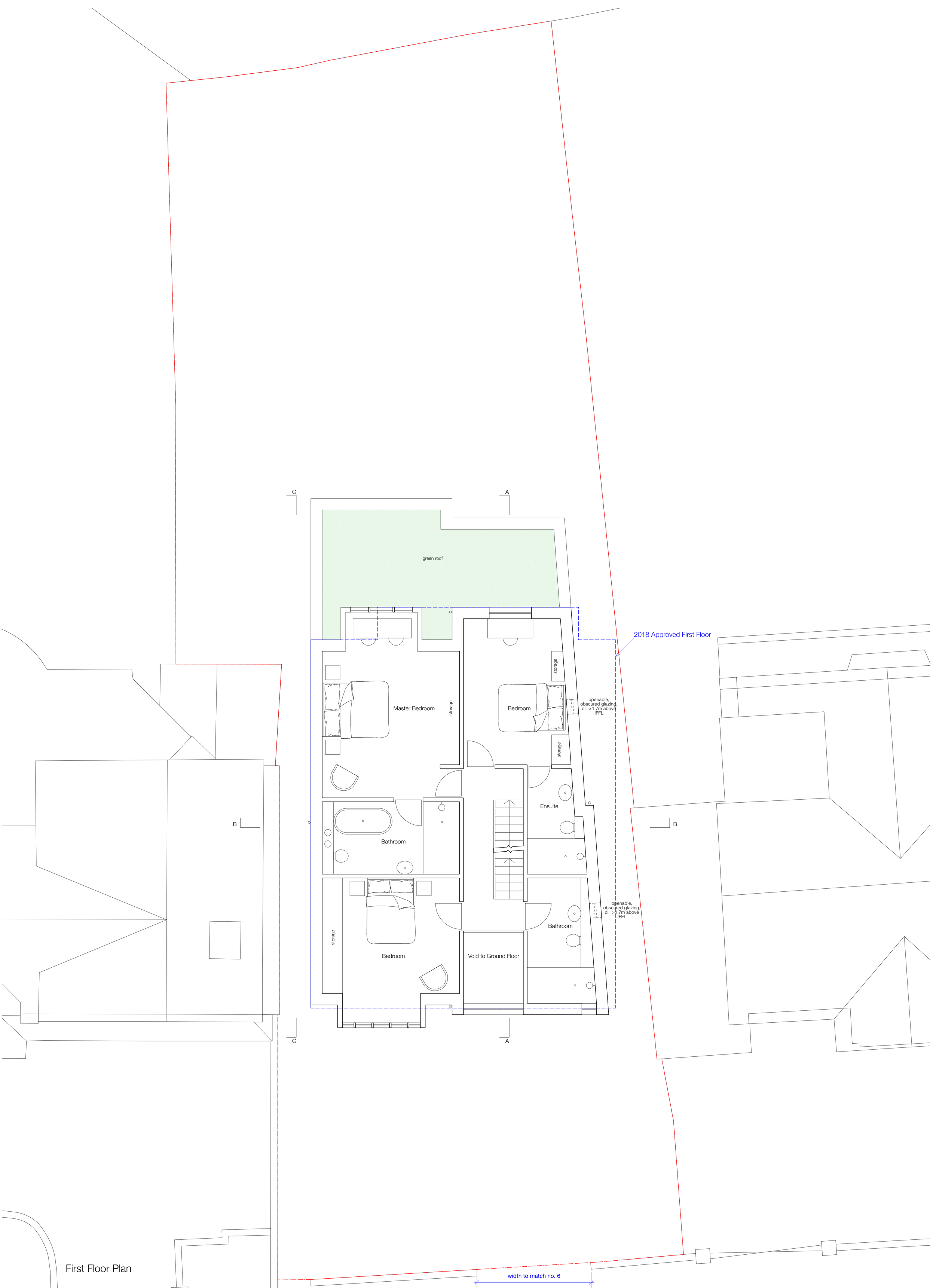
All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road

Sheet No:	Rev:	Date: 30/04/2025
P/101	C	Scale: 1:50 A1 / 1:100 A3

Title: Ground Floor Plan



First Floor Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road		
Sheet No: P/102	Rev: B	Date: 30/04/2025
		Scale: 1:50 A1 / 1:100 A3
Title: First Floor Plan		

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

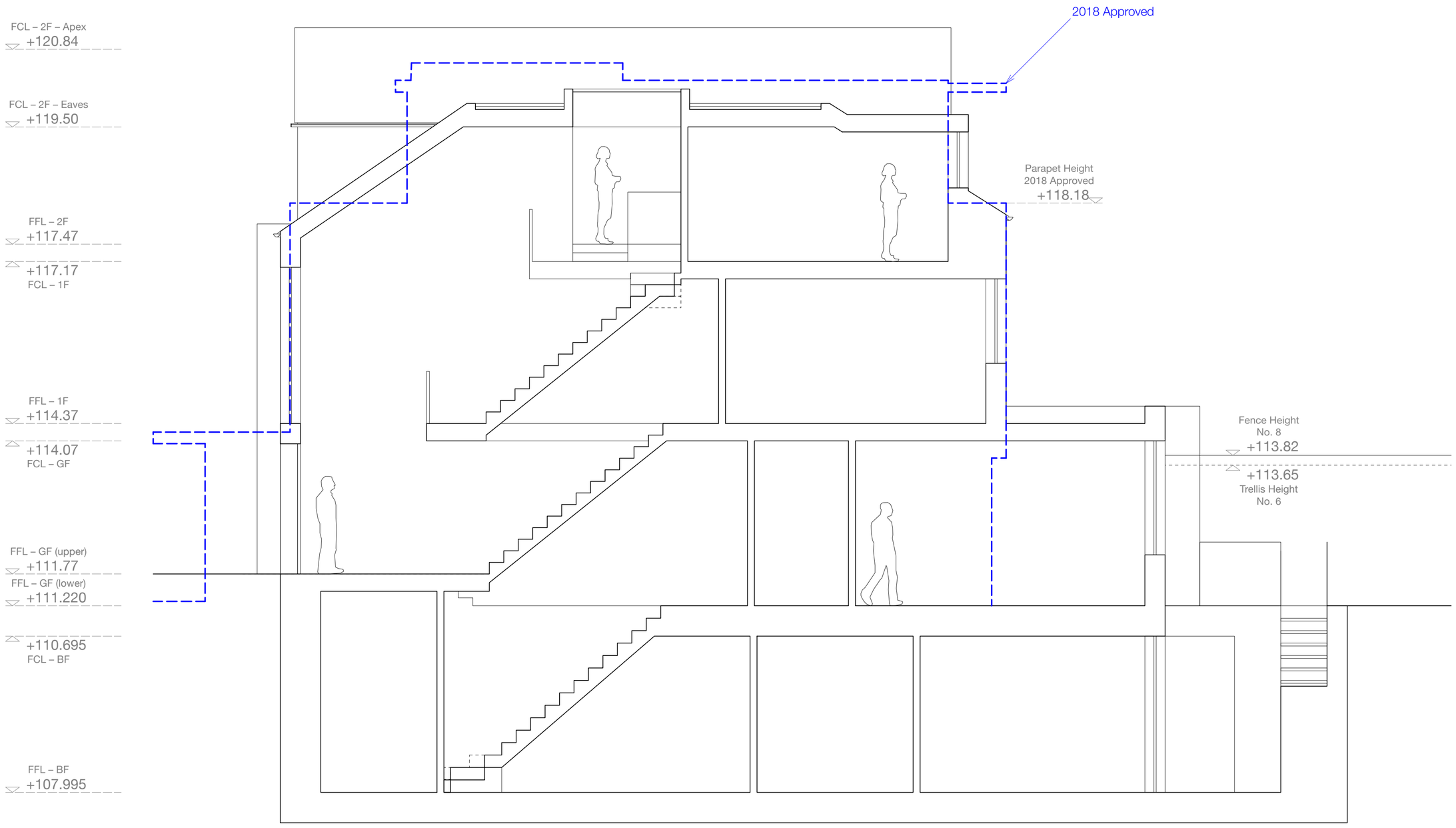
All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

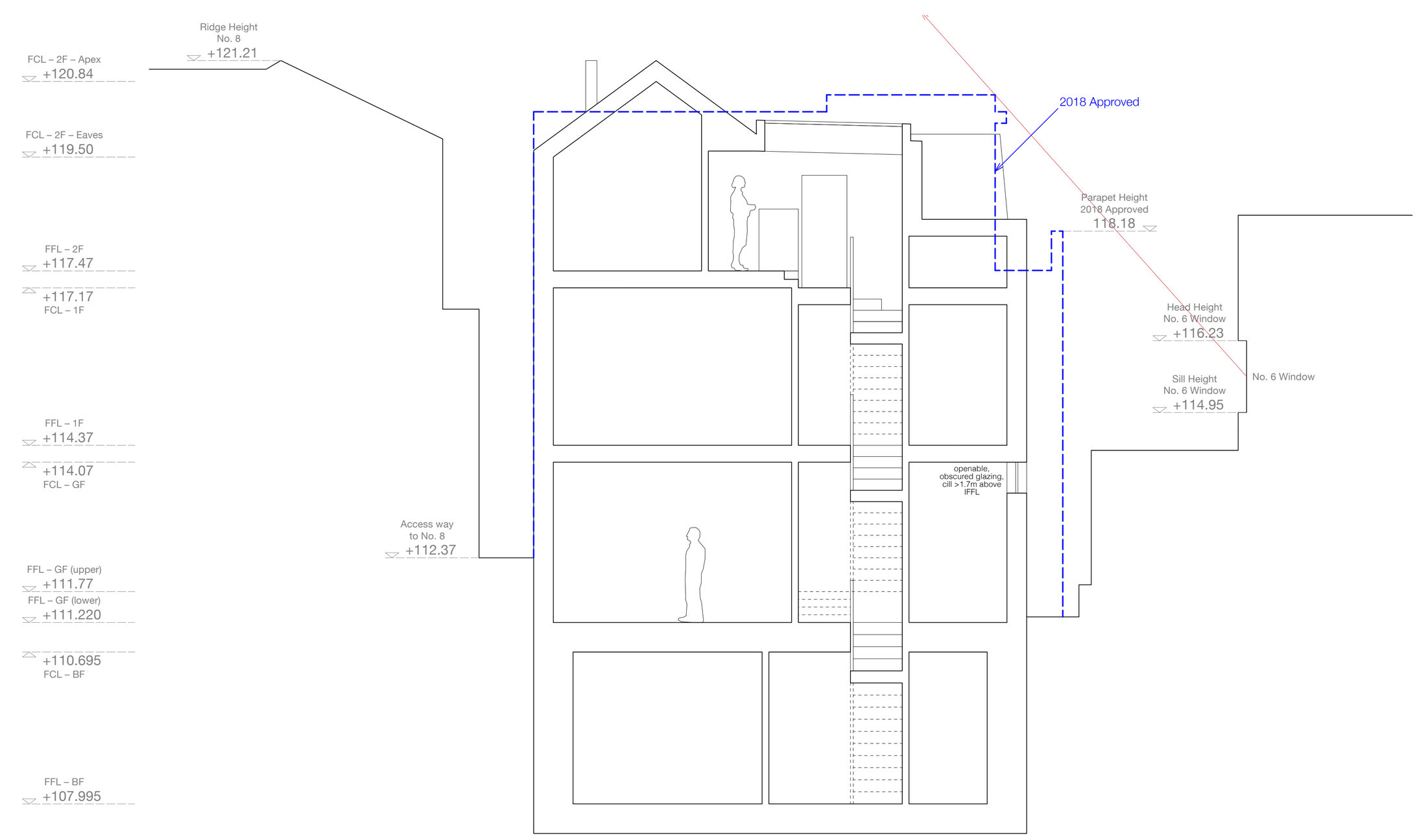
Project: 6a Grange Road

Sheet No:	Rev:	Date: 30/04/2025
P/103	B	Scale: 1:50 A1 / 1:100 A3

Title: Second Floor and Roof Plans



Long Section AA



Short Section BB

Rev.	Details	Date
A	Levels revised to AOD	13/09/24
B	Planning revision	08/11/24
C	Planning revision	30/04/25
D	Basement levels revision	06/06/25

0 0.5 1.0 1.5 2.0 M

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

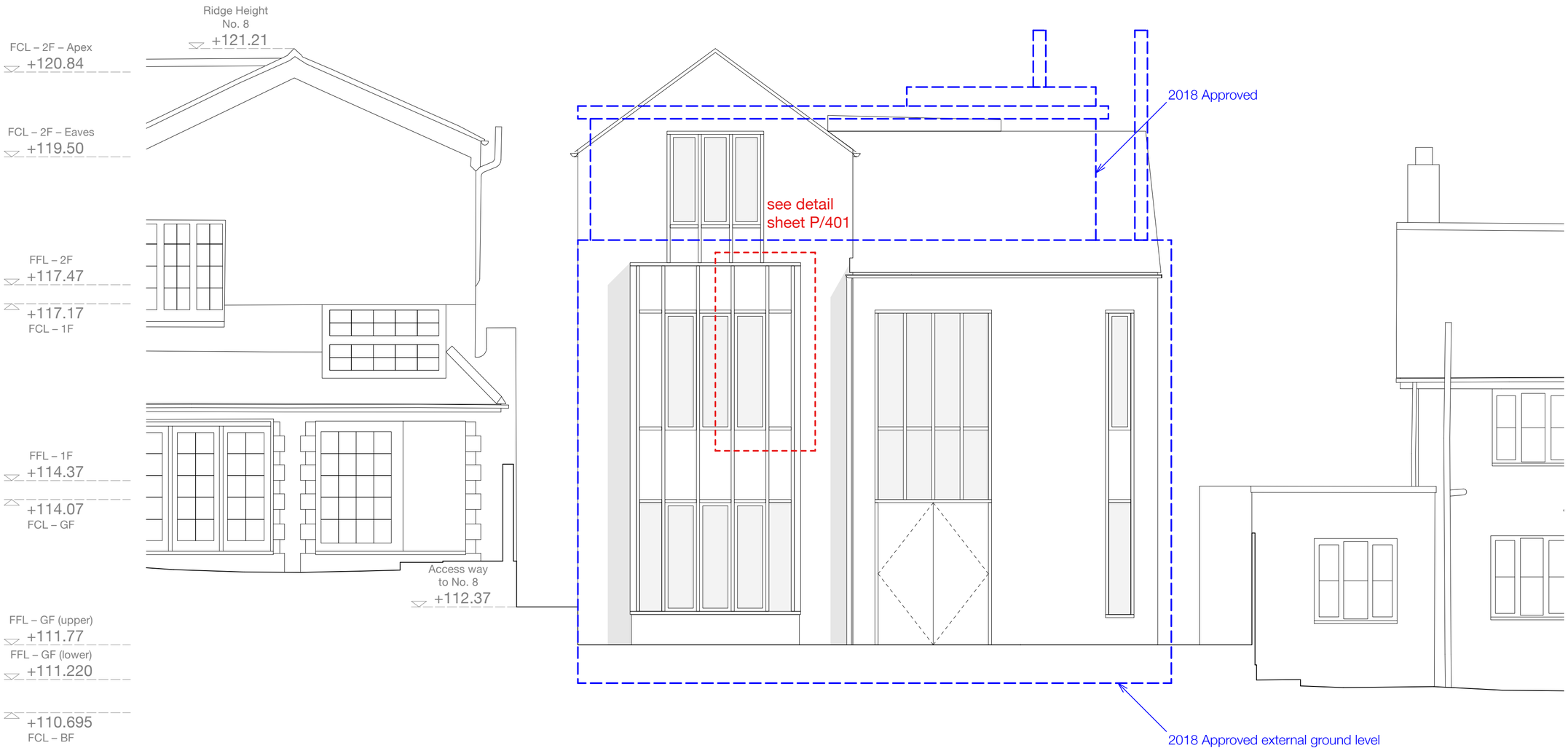
Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road

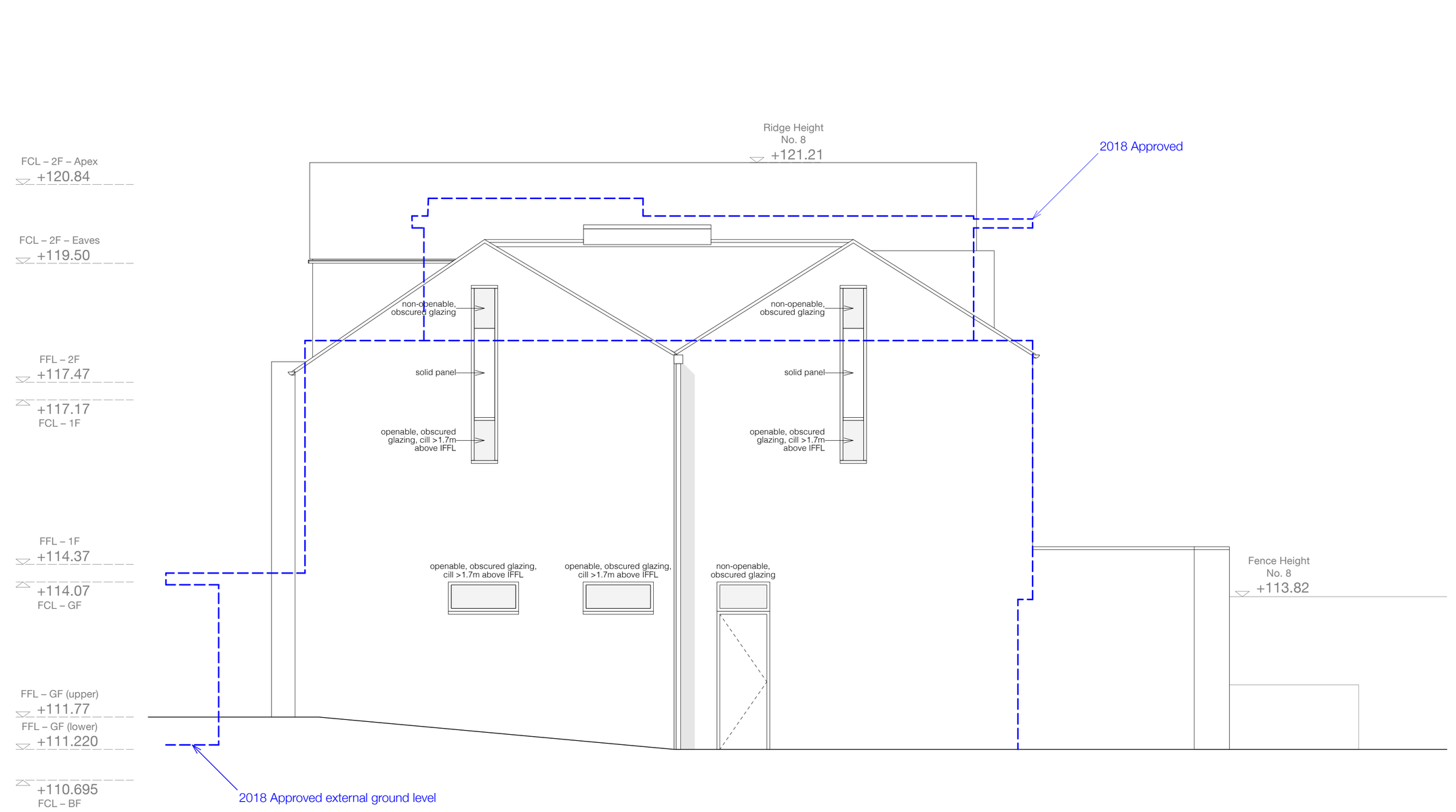
Sheet No:	Rev:	Date: 06/06/2025
P/200	D	Scale: 1:50 A1 / 1:100 A3

Title: Short & Long Sections

Roofs: Slate tile
Walls: Brick
Windows: Powder-coated metal



Front Elevation



Side Elevation No. 6

Rev.	Details	Date
A	Levels revised to AOD	13/09/24
B	Planning revision	08/11/24
C	Planning revision	30/04/25
D	Basement levels revision	06/06/25

0 0.5 1.0 1.5 2.0 M

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

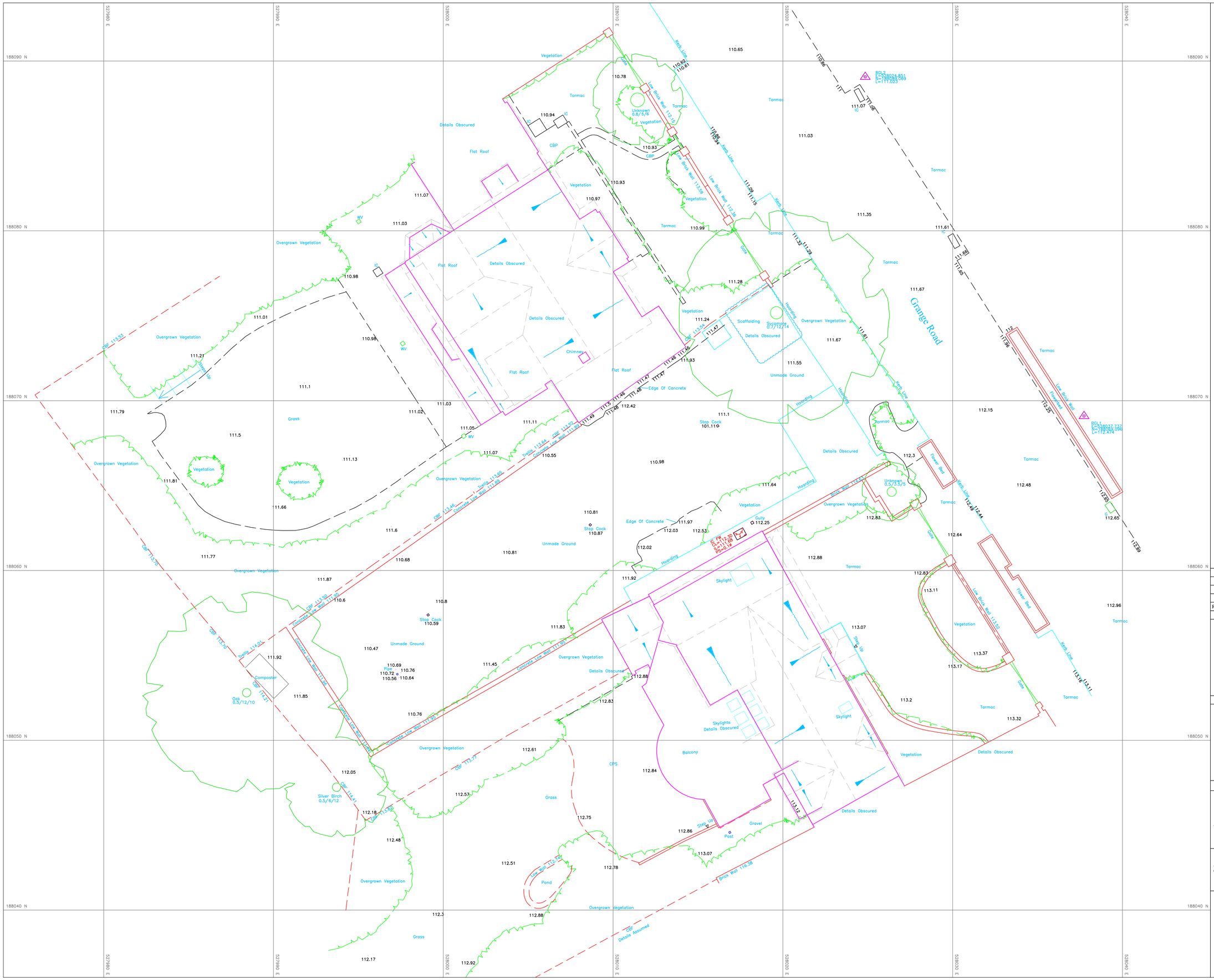
Project: 6a Grange Road

Sheet No:	Rev:	Date: 06/06/2025
P/300	D	Scale: 1:50 A1 / 1:100 A3

Title: Front & Side Elevations

APPENDIX B

Topographical Survey



Legend

OS ACTIVE GPS NETWORK

BT	British Telecom
CATV	Cable Television
CB	Control Box
CBF	Closed Board Fence
CBP	Concrete Block Paving
CL	Cover Level
CLF	Chain Link Fence
CPS	Concrete Paving Slabs
DC	Drainage Channel
DK	Drop Kerb
DP	Down Pipe
ER	Earth Rod
FB	Flowerbed
FH	Fire Hydrant
FP	Flag Pole
G	Gully
GV	Gas Valve
IC	Inspection Cover
IRF	Iron Railing Fence
IL	Invert Level
KW	Kerb Weir
LP	Lamp Post
MH	Manhole
MKR	Marker Post
P	Post
PRF	Post & Rail Fence
PS	Pipe Size
PWF	Post & Wire Fence
RE	Rodding Eye
RN	Road Name
RS	Road Sign
SY	Stay Wire
Sycamore MB	Species Min Multi Bowl
0.3/4/8	Trunk(Dia)/Spread(Dia)/Height(Approx)
TL	Traffic Light
TOB	Top of Bank
TP	Telegraph Pole
UTL	Unable To Lift
VP	Vent Pipe
WL	Water Level
WV	Water Valve
FL 0.00	Floor Level
CL 0.00	Ceiling Height/Level (metres)
FCL 0.00	False Ceiling Height/Level (metres)
BL 0.00	Beam Height/Level (metres)
SL 0.00	Spot Level
	All Arrows Indicate Direction Up
WCL 0.00	Window Cill Level
WHL 0.00	Window Head Level
DL 0.00	Door Level

Rev	Int	Date	Description

Client

Cassion Castle Architects
10 Old Dairy Court
17 Crouch Hill
London
N4 4AP

Job Title

6A Grange Road
London, N6 4AP

Site Survey

Drawn ZB	Scale 1:100 @A1
Levelling: All levels relate to OS Active GPS Network.	Date of Survey: Sept 2024
Notes: All new information has been shown on drawing, RGL-23-4044-01A.	Drawing Number: RGL-24-4230-01

RGL Surveys Ltd
Land & Measured Building Surveyors
Building S8
Westcott Venture Park
Westcott
Bucks HP18 0XB
Tel: 01296 651833
Email: mail@rglsurveys.co.uk
www.rglsurveys.co.uk

Topographic . Measured Building . Revit . Site Engineering . Pointclouds

APPENDIX C

Site Photographs

Plate P1: Site fronting Grange Rd	Plate P2: View west along Site
	
Plate P3: View east towards Site entrance	**Plate P4: Retaining structure along northern boundary**
	

Plate P5: Retaining structure within western section of the Site	Plate P6:
	
Plate P7:	**Plate P8:**

APPENDIX D

Flood Risk Assessment & Drainage Strategy

Our ref: GB/VL/P22-2546/04 Rev A

BY EMAIL ONLY

22nd November 2024

Ilyas Amlani

Dear Ilyas

6A GRANGE ROAD, LONDON, N6 4AP – FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

As requested, we have undertaken a desk-based Flood Risk Assessment (FRA) and Drainage Strategy for the above project. Please find a summary of our key findings below.

Project Context

The site under assessment is known as 6a Grange Road, N6 4AP, located in north London, and is referred to as 'The Site' herein within this assessment. The Site is located on the western side of Grange Road (as shown in Figure 1). The Site was formally a private domestic dwelling which has been demolished. The proposals for the Site are based on a re-designing of the now-demolished building which was previously approved under HGY/2016/3135.

The scheme includes a basement to provide additional living space, a ground floor and two further storeys containing bedrooms and bathrooms.

Architect layout drawings enclosed with this report include the following plans, elevations, and sections: 250606_Grange Road_01.

Objectives

To undertake a Flood Risk Assessment in accordance with the National Planning Policy Framework[1] (NPPF), updated 2021, and Planning Practice Guidance to the NPPF[2] to meet the requirements of a Basement Impact Assessment as required in the Haringey Council's Draft Basement Development Guidance Note[3], June 2012.

[1] Department for Levelling Up, 2023. Housing and Communities, Revised National Planning Practice Framework. [Online]. Available at: https://assets.publishing.service.gov.uk/media/669a25e9a3c2a28abb50d2b4/NPPF_December_2023.pdf [Accessed September 2024]

[2] Department for Levelling Up, Housing and Communities, and Ministry of Housing Communities and Local Government, Flood Risk and Coastal Change Planning Practice Guide. [Online]. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change [Accessed September 2024]

[3] Haringey Council., 2012. Draft Basement Guidance Note. [Online]. Available at: https://www.minutes.haringey.gov.uk/documents/s26669/Basement%20Guidance%20Note%20June%202012.pdf [Accessed September 2024].

To assess the suitability of the scheme in relation to all sources of flooding, and the flood risk posed by the scheme once it is complete and operational.

To suggest mitigation measures to reduce any residual risks to acceptable levels, and progression of an appropriate surface and foul water drainage strategy.

Sources of Information

As part of this study, the following documents have been obtained and reviewed:

- Proposed plans and drawings (by Cassion Castle Architects, November 2024).
- Thames Water Asset Plans (September 2024).
- Thames Water Sewer Flooding History Enquiry (10th September 2024).
- Draft Basement Development Guidance Note[3] – Haringey Council Planning Regeneration & Economy, June 2012).
- Haringey Development Management DPD[4] (July 2017).
- Highgate Neighbourhood Plan[5] (Haringey, April June 2017).
- Haringey Council Strategic Flood Risk Assessment[6] (February 2015).
- Final Draft Surface Water Management Plan 2011[7] (Haringey, 2011).
- London Regional Flood Risk Appraisal[8] (September 2018).
- The London Plan[9]: The Spatial Development Strategy for Greater London (Greater London Authority, March 2021).
- CIRIA SuDS Manual C753 (CIRIA, 2015).
- Environment Agency Website available at gov.uk (Accessed September 2024); and
- British Geological Survey GeoIndex (Accessed September 2024).

Consultation

The agencies and individuals consulted as part of this exercise to obtain records or seek input to the proposals as part of this FRA are listed in Table 1 and key records are enclosed with this report.

[4] Haringey Council., 2017. Haringey Development Management DPD. [Online]. Available at: https://new.haringey.gov.uk/sites/default/files/final_haringey_dmp_dtp_online.pdf [Accessed September 2024].
[5] Highgate Forum., 2017A Plan for Highgate. [Online]. Available at: https://new.haringey.gov.uk/sites/default/files/hnf-plan-v5_adoptionversion-jun17-final-lores-copy.pdf [Accessed September 2024].
[6] JBA Consulting., 2015. Haringey Council Strategic Flood Risk Assessment. [Online]. Available at: https://www.haringey.gov.uk/sites/haringeygovuk/files/strategic_flood_risk_assessment_sfra_level_2_report.pdf [Accessed September 2024].
[7] Haringey Council., 2011. Surface Water Management Plan. [Online]. Available at: https://www.haringey.gov.uk/sites/haringeygovuk/files/haringey_swmp_draft_v2.pdf [Accessed September 2024].
[8] GLA., 2018. London Regional Flood Risk Appraisal. [Online]. Available at: https://www.london.gov.uk/sites/default/files/regional_flood_risk_appraisal_sept_2018.pdf [Accessed September 2024].
[9] GLA., 2021. The London Plan [Online]. Available at: https://www.london.gov.uk/programmes-strategies/planning/london-plan/new-london-plan/london-plan-2021 [Accessed September 2024].

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
Thames Water Property Searches Team	Request for Asset Plans	Clean water and wastewater asset plans were requested to inform the proposals at the Site. The asset plans (enclosed) dated 10th September 2024 show both waste and freshwater assets in the vicinity of the Site.
	Request for Sewer Flooding History Report	A Thames Water Sewer Flooding History Enquiry dated 10th September 2024 confirms that there have been no incidents of flooding in the area as a result of surcharging public sewers.

Table 1: List of key consultations

Flood Risk to the Development (Key Findings):

Flood Zones, Flood Levels & Defence Protection – River Thames

The Site lies within the Environment Agency's (EA) Flood Map for Planning Flood Zone 1, as shown in Figure 2, which is described within the Planning Practise Guide on Flood Risk and Coastal Changes as having a 1 in 1000 or less annual probability of river or sea flooding (>0.1%) in any given year.

The Draft Strategic Flood Risk Assessment (SFRA) shows this site is not at risk of flooding in the event of a breach of the flood defences associated with the River Thames.

From this information, it is shown that the Site is therefore considered to be at a low risk of fluvial and tidal flooding and these sources are not considered further in this report.

Surface Water Flooding

The Long-Term Flood Risk Maps include surface water flood extents (Figure 3) which shows that the site is not at risk from surface water flooding. However, Grange Road carriageway experiences low to medium risk, however, the surface water direction of flow is away from the proposed development. As can be seen in Figures 4 – 6, the Site is not affected by any surface water flooding events.

Flood risk from this source is therefore deemed to be low. Nonetheless, the inclusion of adequate drainage systems will reduce the residual risk of surface water flooding. A surface water drainage strategy is included in subsequent sections of this report.

Groundwater Flooding

BGS mapping shows the bedrock geology at the Site to be comprised of the Claygate member – clay, silt, and sand. There are no superficial deposits at the location of the site.

There are no BGS borehole records proximal to the Site. However, several borehole records in the wider area around the Site indicate that the bedrock geology is Claygate member – clay, silt, and sand.

The borehole references and standing groundwater levels within these boreholes are presented in Table 2, below.

BGS Borehole Ref.	Distance	Depth of sandy clay and gravel	Depth of orange-brown clay	Blue/grey silty clay	Water (m bgl / AOD)
TQ28NE439	188m West	0.8m	1.7m	3m	N/A
TQ28NE438	186m West	0.5m	2.1m	4.5m	N/A
TQ28NE438	188m West	0.9m	2.5m	4.1m	N/A

Table 2: BGS Borehole Records

There have been three instances of groundwater monitoring on Site in 2016 (summer months), 2023 (December), and 2024 (June and September). Several boreholes were commissioned – BH01 (located in the very rear of the garden), WS101 (located in the rear garden in the northwestern area), WS102 (located within the area of the proposed development), and WS103 (located at the front of the proposed development in proximity to the driveway), a plan of their locations is appended to the report.

In borehole BH01, the ground level was 110.56 mAOD and groundwater levels ranged from 107.56 mAOD- 109.28 mAOD (3 – 1.28 bgl), the shallowest groundwater was recorded in December/January. WS01 had a ground level of 110.59 mAOD and groundwater levels of 108.99 mAOD – 109.30 mAOD (1.60 – 1.29 mbgl). WS102 recorded ground levels of 110.87 mAOD and groundwater levels at 109.34mAOD – 109.47mAOD (ranging from 1.53 – 1.4 mbgl). Finally, WS103 recorded a ground level of 111.11 mAOD and groundwater levels at 109.06 – 109.34 mAOD (2.05 – 1.77 mbgl).

Due to the variation in the groundwater levels, a conservative average of 109.34 mAOD has been used for this assessment. The ground level, on average is approximately 110.78 mAOD and therefore the groundwater level is approximately 1.4 mbgl across the Site.

However, after consulting the Hydrological summary reports[1] by the Centre of Ecology and Hydrology for the months relating to the site investigation report (December and January), the sampling has been undertaken when there have been high groundwater levels and rainfall levels.

According to the Architects Plans '250606_Grange Road_01, the basement floor level is 3.75 m below the ground floor finished floor level and the ceiling level of the basement is 0.53 m below the ground floor finished floor level. Therefore, based on the groundwater levels above, the groundwater will be within proximity to the basement level.

Further details about the groundwater and geology on site can be found within the Basement Impact Undertaken at this Site.

Groundwater flooding to proposed substructures therefore remains a residual risk and appropriate mitigation measures are included later in this report.

Flood Risk from Public Sewers

No Thames Water sewers lie within or pass beneath the Site. The site visit shows that there are no public drains proximal to the Site's frontage, and there has been no history of flooding reported in the Thames Water asset searches.

Flooding from public sewers remains a residual risk which will be mitigated through the development of an appropriate drainage strategy in addition to other mitigation measures, as outlined later in this report.

Flood Risk from Water Mains

Flood risk from this source is considered to be a residual risk, with no existing mains shown crossing the Site within the supplied Thames Water asset plans. Flooding from water mains remains a residual risk with appropriate mitigation measures included later in this report.

Flood Risk from Reservoirs/Permanent Water Bodies

Using the Environment Agency Reservoir Flood Extents, it has been confirmed that the site location is beyond the extent of the flood zones. Therefore, this risk is not considered any further.

Flood History

A Thames Water Sewer Flooding History Enquiry confirms there have been no records of sewer flooding events at the Site. A review of the local information indicates that there are no records of historic flooding at the location of the site.

Flood Risk Summary

The Site is at low risk of flooding from most sources, however, a risk of groundwater flooding to substructures remains as well as residual risks associated with water mains, sewer surcharging, and surface water.

Several mitigation measures are recommended below to manage the risks associated with these identified forms of flooding. These are outlined below.

Mitigation

A number of mitigation measures are recommended below to address and manage the risks and residual risks from the identified forms of flooding.

Type of Flooding: Flooding from shallow/perched groundwater

Issue: Shallow/perched groundwater is unlikely to pose a significant risk of flooding to the property at ground level, however substructures could be impacted.

Mitigation Measures:

- Ensure foundations and any below ground infrastructure are appropriately waterproofed to prevent groundwater seepage into the development or infrastructure.
- Consider the need for de-watering during construction.
- Ensure appropriate measures are put in place to ensure any groundwater flow is not impeded.

A number of measures are recommended to manage the other residual risks of flooding as part of the design, construction and occupation of the Site:

- Inclusion of a maintenance and management plan for the various drainage assets as detailed below;

- All existing drainage and water supply pipes within the Site will be suitably located and marked prior to the commencement of construction to minimise the risk of strikes during excavation works; and
- Routine inspection of the public sewers, site drainage, and public and internal water supply pipe work/storage should be undertaken by Thames Water and the Site owner during the construction and operational phase.
- An appropriate drainage strategy should be developed (as below) whilst the design of the site should consider exceedance flow routing to ensure any flooding beyond the design standard is directed away from the proposed dwelling.

Flood Risk from the Development

Existing Foul Water Drainage

There is existing foul infrastructure that serves the current property on the Site; however, from the demolition of the building it is assumed that any structures related to foul drainage on the Site in relation to the connection point(s) have hopefully been retained and capped.

A grey water outlet from number 8 Grange Road currently discharges informally into the site. This has been installed since the original demolition of number 6a (the Site). This will be retained as far as possible. A CCTV drainage survey will need to be undertaken to inform the status of any existing foul drainage affecting the Site. This will be necessary to confirm what is present on the Site and to formalise the discharge from number 8 Grange Road as it is an existing sewer connection that was removed by the demolition.

Proposed Foul Water Drainage Strategy

Foul water from the Site will be designed to drain to the existing foul water sewer located in Grange Road. The buildings adjoining the site boundary are assumed to also join the public sewer here via private connections.

Historically there was a grey water outlet discharge sewer located within the pathway between numbers 8 and 6a, this was partially demolished when the previous building located at the Site was demolished in 2019. However, it is proposed that the foul water sewer connection point will be reused where feasible or a new connection will be constructed, depending on the outcome of the CCTV drainage survey that will need to be undertaken at the detailed design stage. An indicative foul sewer run is shown on Drawing 2546_02_001B which will connect to the existing TW foul sewer in Grange Road.

Any proposed new connection will be confirmed with Thames Water via a Section 106 application at the detailed design stage to agree on the site drainage layout, connection points, and flow rates. An indicative connection point is shown in Drawing 2546_02_001B.

The need for foul water pumping should be considered further at the detailed design stage given the presence of a basement level in the building and the adjacent sewer levels not being known.

Foul Water Drainage During the Construction Phase

The proposed shared sewer will be constructed during the initial phase of works on site. Once a connection has been made to the public sewer, the existing greywater outlet will be diverted and connected to the newly constructed shared sewer.

The existing informal greywater outlet will be maintained as per the current outfall regime until the proposed shared sewer is fully operational. Once connected the route of the sewer will be marked and appropriate avoidance measures put in place to minimise the risk of damage during the latter stages of construction.

Existing Surface Water Drainage

The previous property on Site was demolished in 2019, along with the shared drainage infrastructure associated with 6a and 8 Grange Road. However, it is unknown the extent to which any of this drainage infrastructure remains on the Site of 6A, therefore, during the detailed design stage a CCTV drainage survey will need to be undertaken.

Proposed Surface Water Drainage Strategy

The following provides a summary of the proposed method of management and disposal of surface water runoff from the Site:

- The proposed development will drain via a SuDS strategy including permeable paving, green roofing, and attenuation crates.
- Permeable paving has been proposed within the driveway (78m2) which connects to a manhole (MH1.001) which then runs along the northern boundary of the proposed development (east to west). This then drains to another manhole (MH1.002) collecting the green roof drainage, which drains to the treatment chamber (MH.1003 Aqua Swirl) before entering the tank (MH1.004). It is then pumped back the way it came via a rising main, (west to east along the northern boundary of the building) and meets a disconnection chamber (MH1.005), at the far eastern point of the driveway where the rising main changes to a gravity sewer connecting to the TW Sewer located in Grange Road.
- The sunken garden will be drained separately and will connect to the proposed surface water sewer before entering the aqua swirl and then the tank.
- There is a pitched roof at the front of the building so there will be rainwater pipes collecting water from the roof in these areas. Therefore, a nominal area value has been added to the permeable paving calculations so that some of the roof drainage will be in the permeable paving.
- A 50 mm orifice has been added from the permeable paving to MH1.001 as it maximises the storage within the permeable paving so that the crate storage can be smaller (due to site constraints).
- The crates are restricted in size due to the basement location; this is because a reasonable clearance is necessary. There is also a restraint due to groundwater presence in the rear garden, which would potentially lead to floatation and water ingress. In addition, there may be potential issues with root protection zones. Both of these factors need to be further investigated at the detailed design stage.
- The site area needing to be drained (162m2) has been split between the green roof, permeable paving, and attenuation crates. The front part of the roof will drain directly into the permeable paving which will then lead to the attenuation tank via the proposed surface water sewer. Flows from the downpipe along the northern boundary of the proposed development will be collected in the proposed surface water sewer (running east to west), along with all flows that the green roof collects. This is then all passed through the Aqua Swirl which flows into the tank.
- In the worst-case scenario, the roof water (untreated) will flow into the aqua swirl (to be treated) and then into the attenuation crates prior to a controlled discharge into the TW surface water sewer.

- An attenuation tank is proposed to store all flows within the site below ground up to and including the 1 in 100 year plus 40% climate change event. The storage crate is 12m2, and 0.8m deep positioned within the rear garden of the proposed dwelling.
- The surface water drainage proposals are included in Drawing 2546_02_001B enclosed with this report. This is based on layout plans included within '250606_Grange Road_01' in addition to the Topographic Survey RGL-24-4230-01.
- An appropriate Section 106 application will be submitted to Thames Water to agree on the site drainage layout, connection point, flow rates, and any alterations to the existing drainage infrastructure as part of the latter stages of design.
- The 1.0 l/s outfall rate is the lowest operable rate allowed by the proposed flow control device. This is required to provide a flushing flow to entrained debris and reduce maintenance requirements.
- In terms of an exceedance flow path, if the Surface Water sewer were to surcharge, if flooding was to occur, from the driveway it would drain down either side of the house and to the garden which has a retaining wall, meaning that water would collect at the rear of the property away from the building. The proposed levels are higher at the front of the proposed development than at the back so water will flow along its natural path, leading to the garden.
- Water quality as part of the SUDS management train suitable pollution measures must be included to ensure infiltrating water quality meets acceptable standards as set out within Chapter 26 of the SUDS Manual.
- The SUDS manual provides guidance, in Table 26.2, on the expected pollutant loads for the various impermeable surfaces relevant to this site. These include residential roofs/individual property driveways, which have pollution hazard indices of 0.2 and 0.5 respectively for Total Suspended Solids (TSS), 0.2 and 0.4 for Metals (M), and 0.05 and 0.4 for Hydrocarbons (H).
- The expected pollution treatment capacity of potential SUDS methods is also provided in Tables 26.3 and 26.4 of the SUDS Manual. On this basis and using the guidance in Tables 26.3 and 26.4 the following pollution management train will be used:
    - All driveways and paving areas will drain via tanked permeable paving providing mitigation indices of 0.7 (TSS), 0.6 (M), and 0.7 (H).
    - All roof drainage will discharge into the permeable paving (at the front of the proposed development) or will travel via the proposed surface water sewer to the Aqua Swirl Treatment device and then into the tank.
    - Roof areas will be laid to green roof as per the architect's drawings.
- It is therefore considered based on the above indices that the proposed SUDS measures provide suitable water quality treatment, at source, for the site.

Management and Maintenance Plan

Regular inspection and maintenance of adjacent highway drainage, public and private drainage by the London Borough of Haringey, Thames Water, and site management respectively, will minimise the residual risks associated with surface water/sewers. The responsibility of upkeep and maintaining the SuDS network proposed above lies with the freeholder, this this case the site owners responsibility.

The following maintenance schedule (Table 3) for the proposed SUDS should be undertaken to ensure efficient operation and to prevent failure.

Drainage Feature	Maintenance	Maintenance Period
Manholes	Inspect and identify any areas that are not operating correctly. If required, take remedial action Check free from silt and debris and water discharging freely through. Jet/clear out as necessary. Repair / rehabilitate inlets, outlets, overflows, and vents	Monthly for first three months, then annually. Every 6 months As required
Drainage Pipework	CCTV inspection/condition survey Sewer jetting	Every 5 years Every 2 years
Attenuation Tank	Remove debris from the catchment surface (where it may cause risks to performance) Repair / rehabilitate inlets, outlet outflows, and vents Survey the inside of the tank for sediment build-up and remove it if necessary. Clear any pipe blockages with appropriate equipment.	Monthly Annually Every 5 years or as required
Permeable Paving	Initial Inspection Brushing and vacuuming (Standard cosmetic sweep over the whole surface). Inspect silt accumulation rates and establish appropriate brushing frequencies. Stabilise and mow contributing and adjacent communal areas and remove weeds using glyphosate. Remedial work to depressions, rutting, and cracked or broken blocks is considered detrimental to the structural performance or a hazard. Inspect silt traps and note the rate of sediment accumulation.	Monthly for three months after installation. Annually Annually As required As required Monthly in the first year and then annually
Green Roof	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly- or as required. Annually

Drainage Feature	Maintenance	Maintenance Period
	Inspect all components including soil substrate, vegetation, drains, and irrigation systems. Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system. Replace dead plants where (>5% coverage). Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system.	Annually Monthly Annually

Table 3: Outline SuDS Management and Maintenance Schedule

Flood Risk from the Development/Drainage Assessment

Impact on Surrounding Areas

The proposed development will increase foul flows from the current state (given that the previous development has been demolished). Foul flows will be accommodated within the foul sewer network and are not envisioned to be a higher volume than the previously connected property. Surface water will be managed by the proposed SuDS Strategy and restricted outflow to the surface sewer and will be lessened in volume by the increased opportunity for uptake and evaporation provided by green roofing and permeable paving. Therefore, the proposed development is unlikely to have a significant impact on the local public sewer network or increase the risk of flooding to surrounding development.

Conclusions and Recommendations

We conclude that no significant sources of flooding have been identified as part of this study that warrant further consideration as part of a more detailed Flood Risk Assessment.

Several mitigation measures are recommended to address the low risk of groundwater flooding and residual risks of, surface water, public sewers, site drainage, and public and internal water supply pipe work/storage. These risks can be managed by the design of the site drainage, and by regular inspection and maintenance of the public and private sewer and water supply network. Furthermore, it should be noted that high groundwater levels and root protection zones have been highlighted as potential issues within the detailed drainage strategy, these will need to be considered as part of the design process at the detailed design stage.

Yours sincerely

Grace Beard
Flood Risk Consultant

Graham Sinclair
Technical Director

Encs

- Constraints and Limitations
- References
- Figure 1: Site Location Plan
- Figure 2: EA Fluvial/Tidal Flood Zone Map
- Figure 3: EA Surface Water Extent
- Figure 4: EA Surface Water Flood Risk Map (1 in 30 Year Event)
- Figure 5: EA Surface Water Flood Risk Map (1 in 100 year Event)
- Figure 6: EA Surface Water Flood Risk Map (1 in 1000 Year Event)
- Thames Water Asset Plans
- Thames Water Flooding History Enquiry
- 250606_Grange Road_01
- Topographic Survey RGL-24-4230-01.
- Surface Water Drainage Strategy – Drawing 2546_02_001B.
- FLOW Calculations

ENCLOSURES

Constraints and Limitations

Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

This report has been undertaken with the assumption that the Site will be developed in accordance with the above proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the Site.

Create Consulting Engineers Ltd has endeavoured to assess all information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy of the information relied upon. Information from third parties has not been verified by Create Consulting Engineers Ltd unless otherwise stated in this report.

References

i. JBA Consulting: Haringey Council Strategic Flood Risk Assessment Draft 2015.

ii. British Geological Survey GeoIndex (Accessed September 2024).

iii. CIRIA. (2015). CIRIA SuDS Manual C753.

iv. Data.gov.uk. (2019). Flood Maps, Surface Water, Groundwater Maps and Reservoir Flood Maps. (Accessed September 2024).

v. Greater London Authority. (2021) The London Plan: The Spatial Development Strategy for Greater London.

vi. Highgate Neighbourhood Plan (2017).

Figure 1: Site Location Plan *Source: Google Earth Mapping (2024)*

Figure 2: EA Fluvial/Tidal Flood Zone Map *Source: Defra Data Services Platform* ((https://environment.data.gov.uk/)

Figure 3: EA Surface Water Extent *Source: Defra Data Services Platform (*https://environment.data.gov.uk/*).*

Figure 4: EA's Surface Water Flood Depths Map 1 in 30 Year Event (3.3%) *Source: Defra Data Services Platform (*https://environment.data.gov.uk/*)*

Figure 5: EA's Surface Water Flood Depths Map 1 in 100 Year Event (1.0%) *Source: Defra Data Services Platform* (https://environment.data.gov.uk/)

Figure 6: EA's Surface Water Flood Depths Map 1 in 1000 Year Event (0.1%) *Source: Defra Data Services Platform* (https://environment.data.gov.uk/)

Asset Location Search

Thames Water Property Searches

Create Consulting Engineers Ltd
CREATE CONSULTING ENGINEERS LT
15Princes Street
NORWICH
NR3 1AF

Search address supplied 6A
Grange Road
London
N6 4AP

Your reference P22-2546

Our reference ALS/ALS Standard/2024_5047388

Search date 10 September 2024

Notification of Price Changes

From 1st April 2024 Thames Water Property Searches will be increasing the prices of its CON29DW Residential and Commercial searches along with the Asset Location Search. Costs will rise in line with RPI as per previous years, which is sat at 6%.

Customers will be emailed with the new prices by February 28th 2024.

Any orders received with a higher payment prior to the 1st April 2024 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset Location Search

Property Searches

Search address supplied: 6A, Grange Road, London, N6 4AP

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

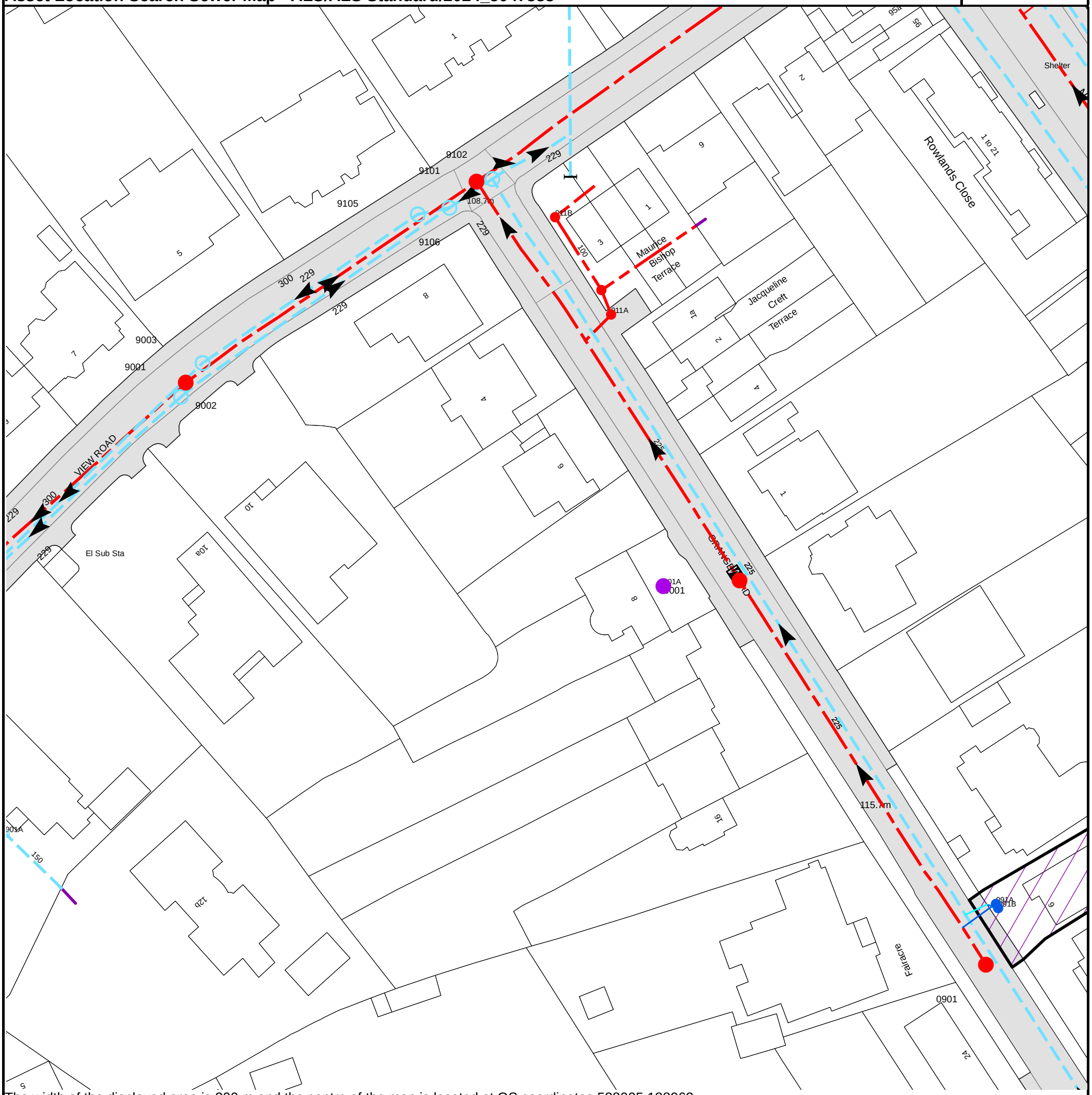
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2024_5047388



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 528005,188063

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
001A	n/a	n/a
0901	116.71	112.83
091A	116.5	116.01
091B	116.5	115
0001	113.05	108.89
9106	108.37	105.84
9101	108.68	104.8
9102	108.64	106.24
901A	n/a	n/a
9002	108.33	106.92
9001	108.42	105.62
9003	108.43	104.58
011A	n/a	n/a
01YS	n/a	n/a
011B	n/a	n/a
9105	108.63	105.71

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or divects the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

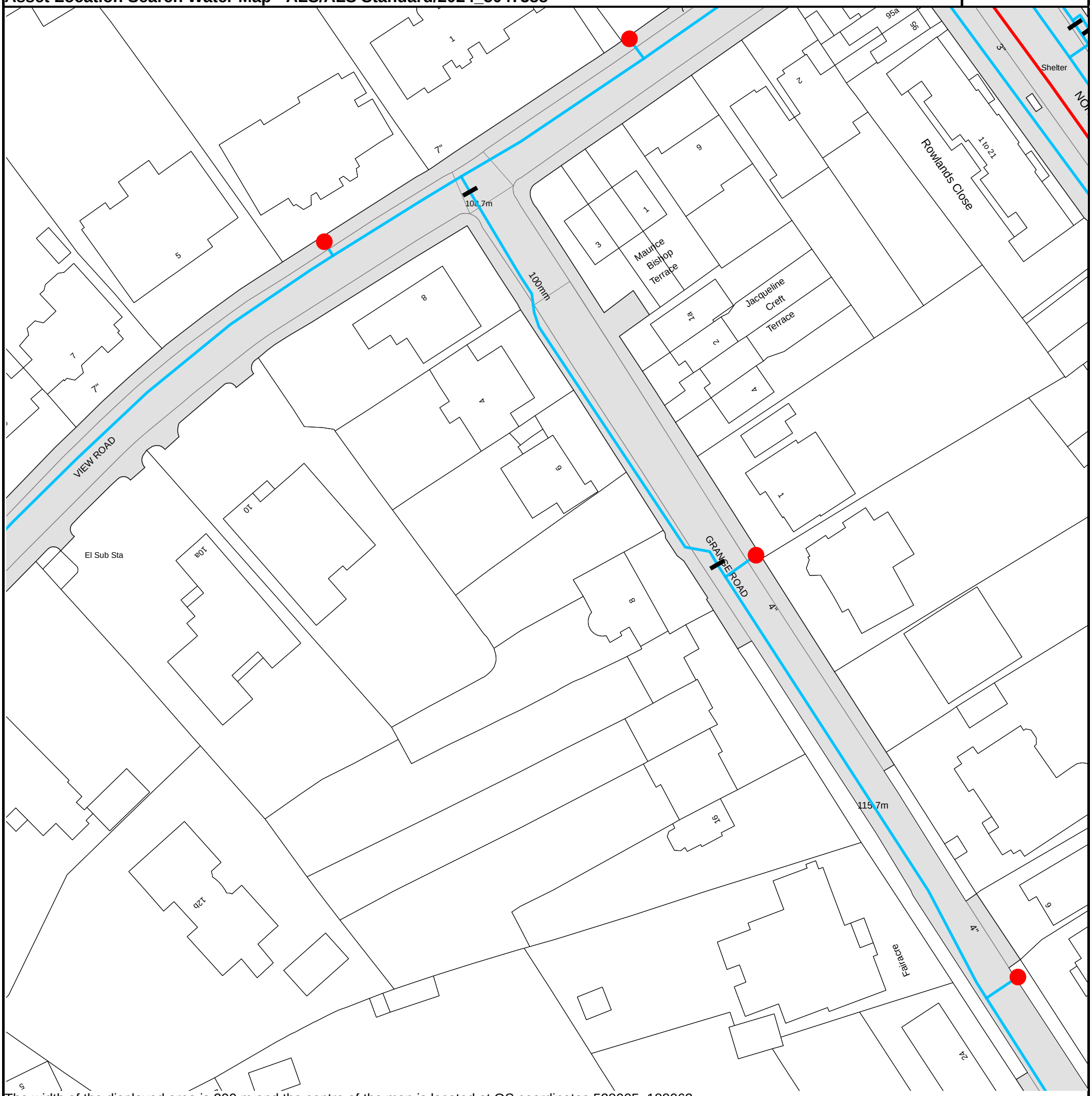
- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2024_5047388



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 528005, 188063.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger
- **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 980 8800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Sewer Flooding
History Enquiry

Property Searches

Create Consulting Engineers Ltd

Princes Street

Search address supplied	6A Grange Road London N6 4AP
Your reference	P22-2546
Our reference	SFH/SFH Standard/2024_5047389
Received date	**10 September 2024**
Search date	**10 September 2024**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: 6A,Grange Road,London,N6 4AP

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

C

A

Walk-on obscured rooflights to basement

planting

External
Sunken Garden

Family
Room

Ground Floor Above

Gym

Bathroom

Wine
Cellar

Storage/
Plant

Home
Cinema

Utility

B

RPA Horse Chestnut (T008)

RPA Sycamore (T007)

C

A

B

width to match no. 6

Basement Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road		
Sheet No: P/100	Rev: B	Date: 30/04/2025
		Scale: 1:50 A1 / 1:100 A3
Title: Basement Floor Plan		

replacement tree
replacement tree
replacement tree
top face of existing retaining walls
replacement tree
replacement tree
top face of existing retaining walls
replacement tree
replacement tree
C
A
basement extends under landscaping
Walk-on obscured rooflights to basement
planting
External Sunken Garden
Dining
Kitchen
2018 Approved Ground Floor
fireplace
Lounge
B
Storage
openable, obscured glazing, cill >1.7m above IFFL
B
Bathroom
openable, obscured glazing, cill >1.7m above IFFL
RPA Sycamore (T007)
Ramp
RPA Horse Chestnut (T008)
fireplace
Formal Lounge
Double Height Space Above
Bootroom
Covered Porch
C
A
replacement tree
Existing driveway reinstated in same location
Cycle & Bin Store
width to match no. 6

Ground Floor Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Demolished building location	11/11/24
C	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

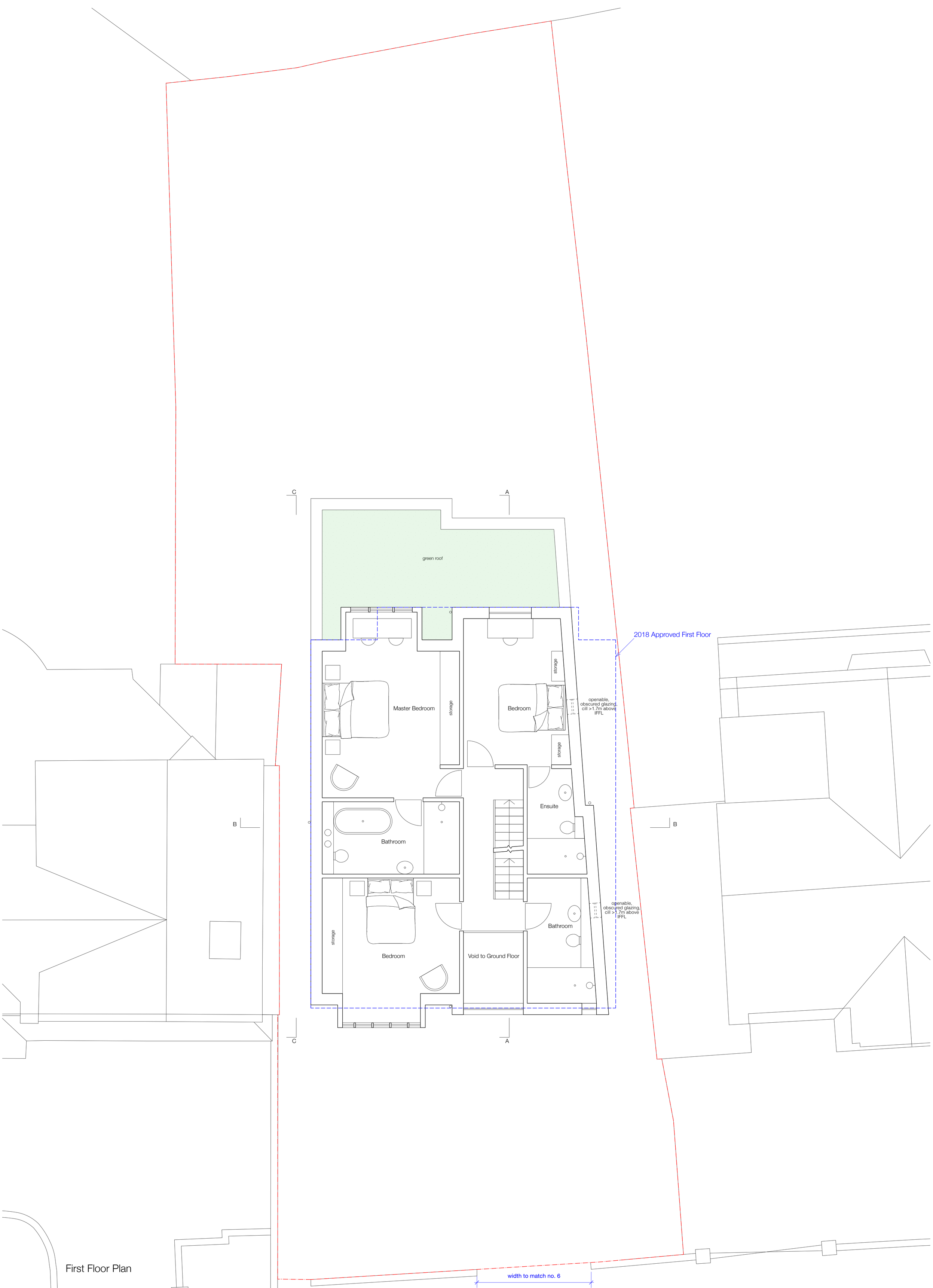
All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road

Sheet No:	Rev:	Date: 30/04/2025
P/101	C	Scale: 1:50 A1 / 1:100 A3

Title: Ground Floor Plan



First Floor Plan

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road		
Sheet No: P/102	Rev: B	Date: 30/04/2025
		Scale: 1:50 A1 / 1:100 A3
Title: First Floor Plan		

Rev.	Details	Date
A	Planning revision	08/11/24
B	Planning revision	30/04/25

0 0.5 1.0 1.5 2.0 M

N

Do Not Scale From This Drawing:

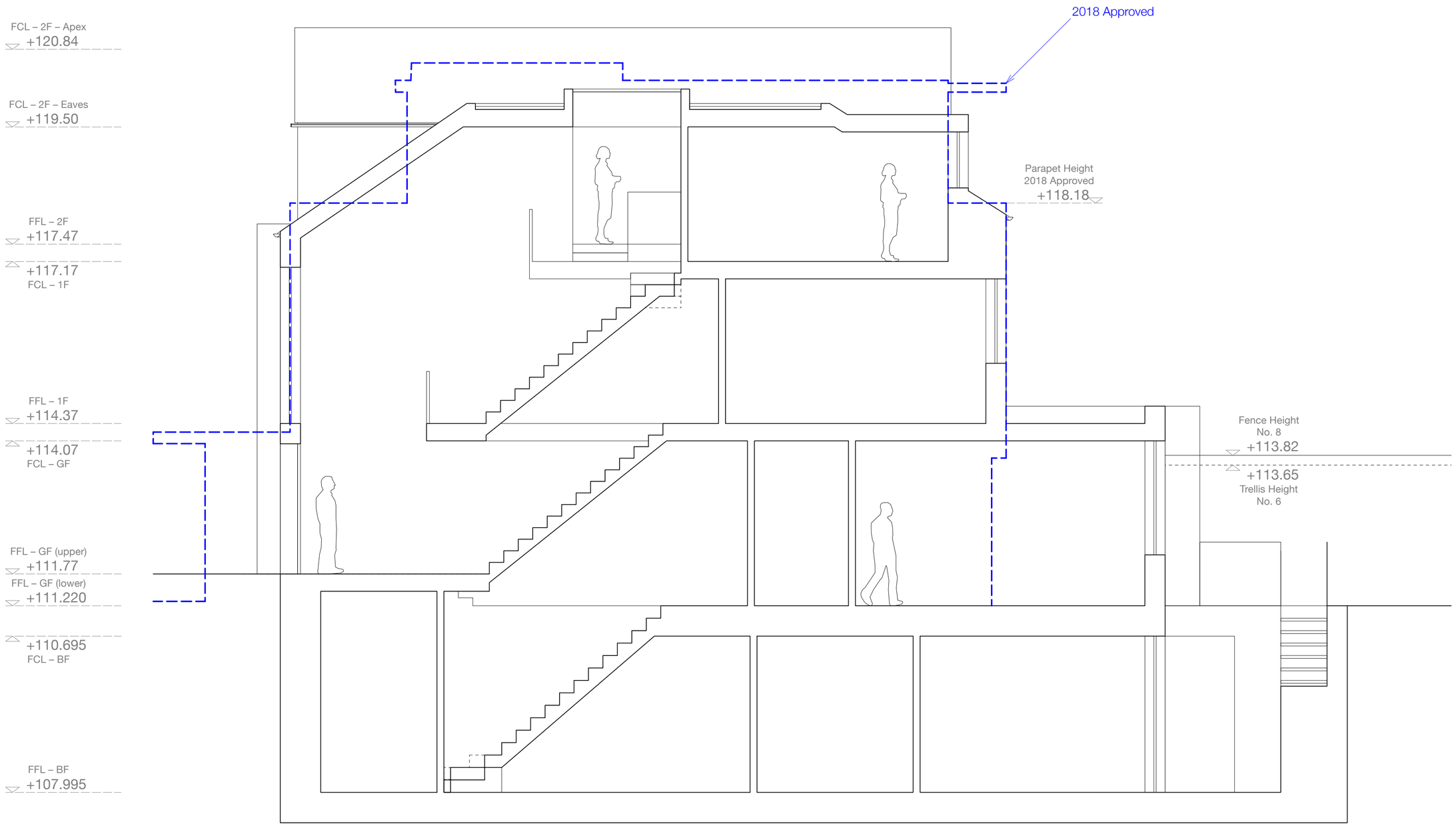
All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

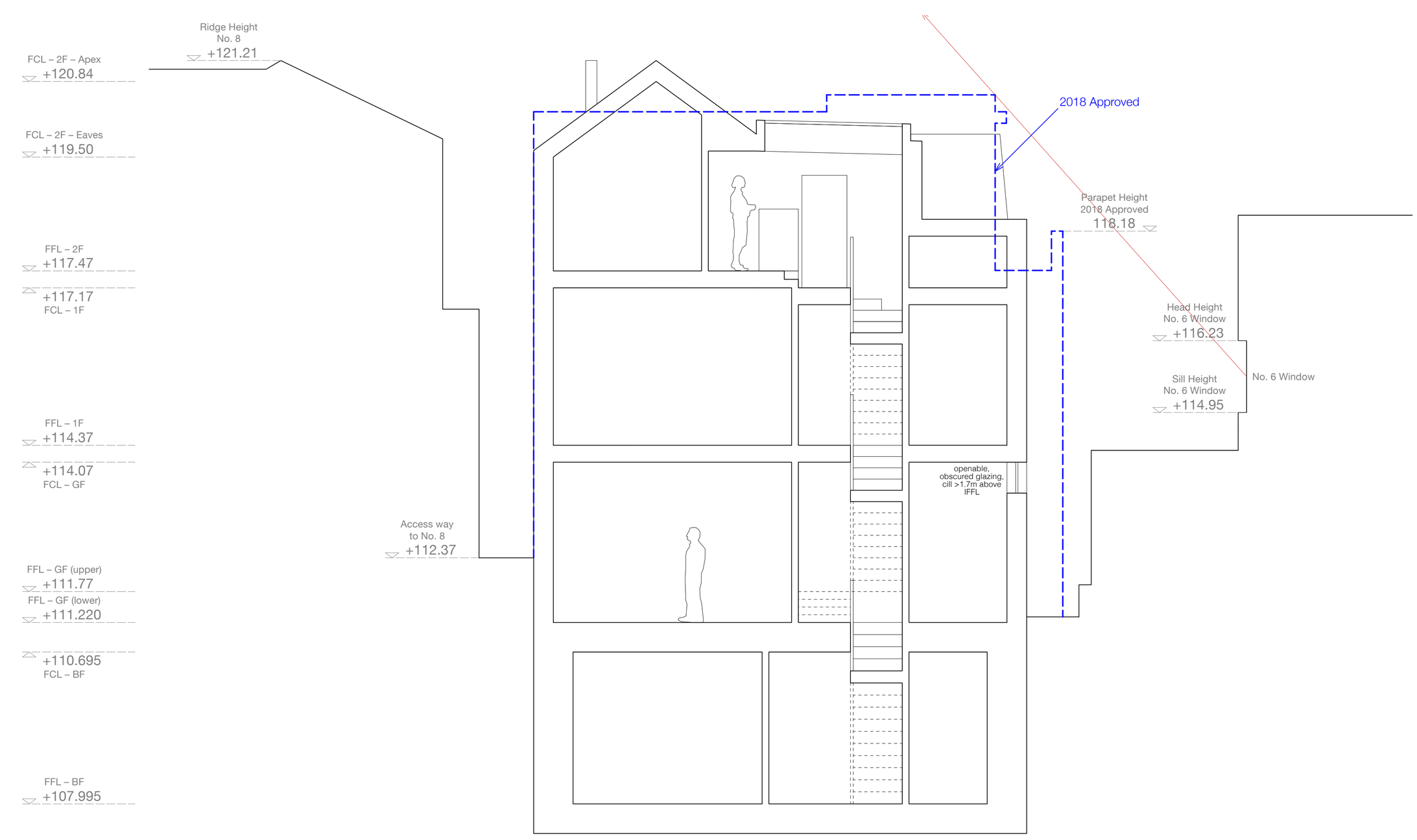
Project: 6a Grange Road

Sheet No:	Rev:	Date: 30/04/2025
P/103	B	Scale: 1:50 A1 / 1:100 A3

Title: Second Floor and Roof Plans



Long Section AA



Short Section BB

Rev.	Details	Date
A	Levels revised to AOD	13/09/24
B	Planning revision	08/11/24
C	Planning revision	30/04/25
D	Basement levels revision	06/06/25

0 0.5 1.0 1.5 2.0 M

Do Not Scale From This Drawing:

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

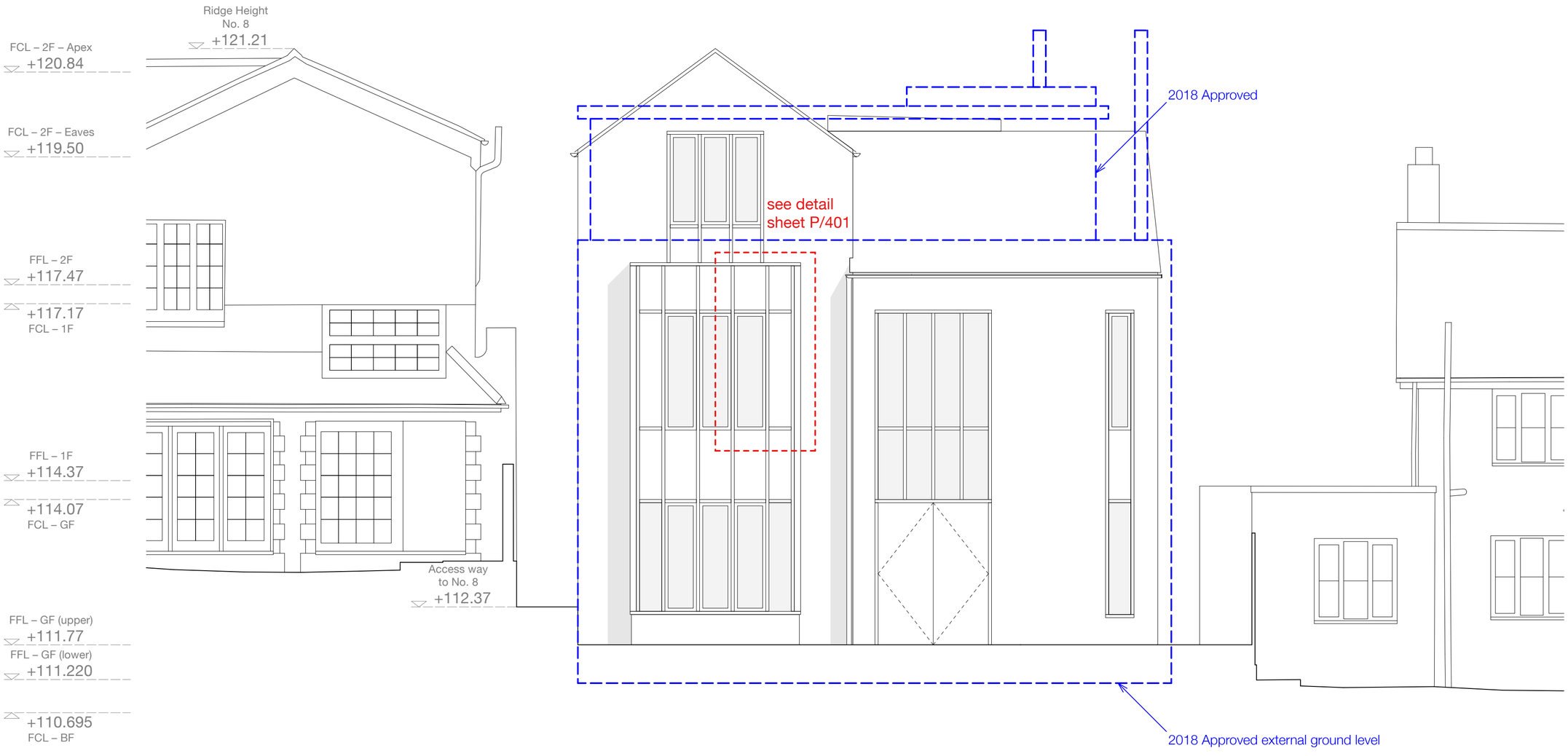
Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road

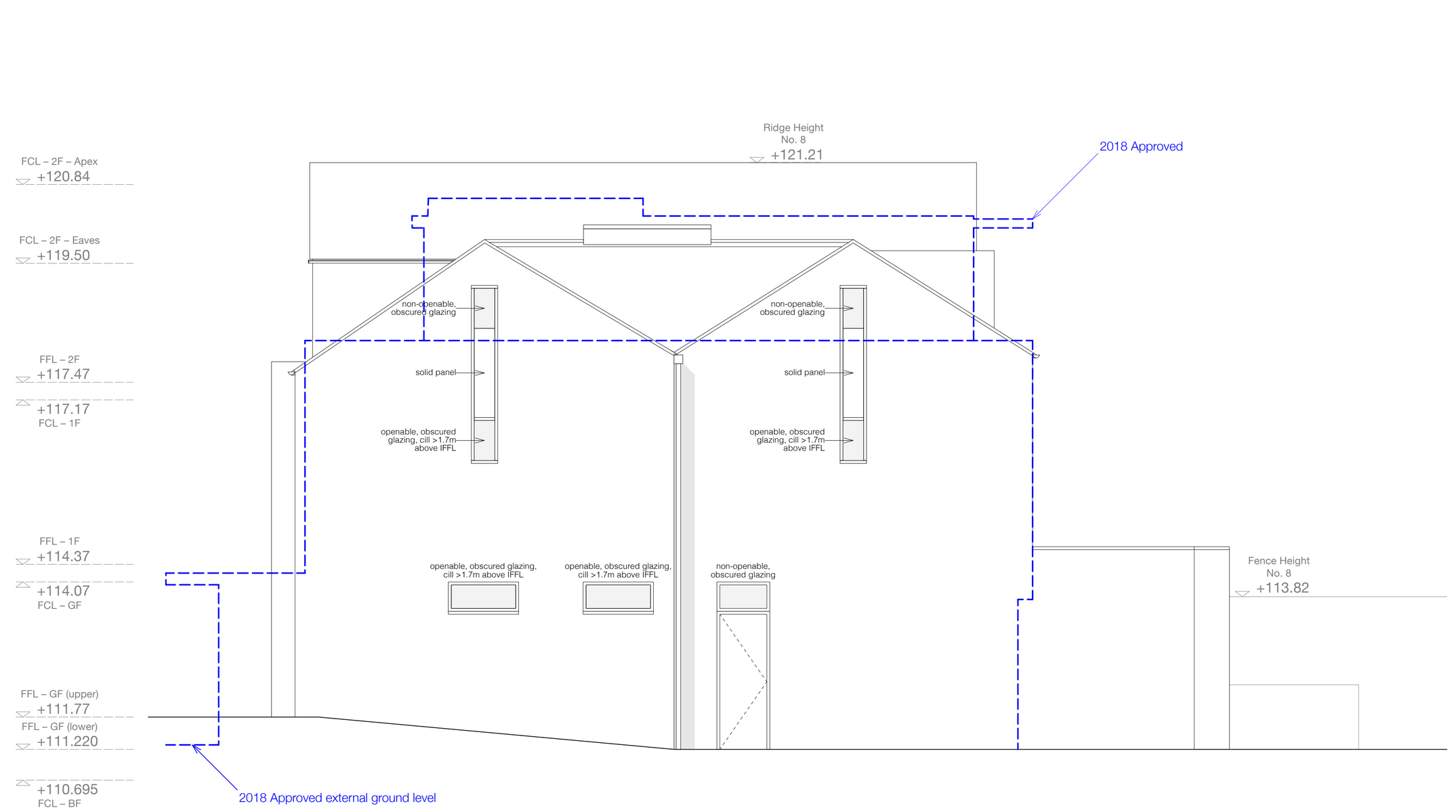
Sheet No:	Rev:	Date: 06/06/2025
P/200	D	Scale: 1:50 A1 / 1:100 A3

Title: Short & Long Sections

Roofs: Slate tile
Walls: Brick
Windows: Powder-coated metal



Front Elevation



Side Elevation No. 6

Rev.	Details	Date
A	Levels revised to AOD	13/09/24
B	Planning revision	08/11/24
C	Planning revision	30/04/25
D	Basement levels revision	06/06/25

0 0.5 1.0 1.5 2.0 M

Do Not Scale From This Drawing:

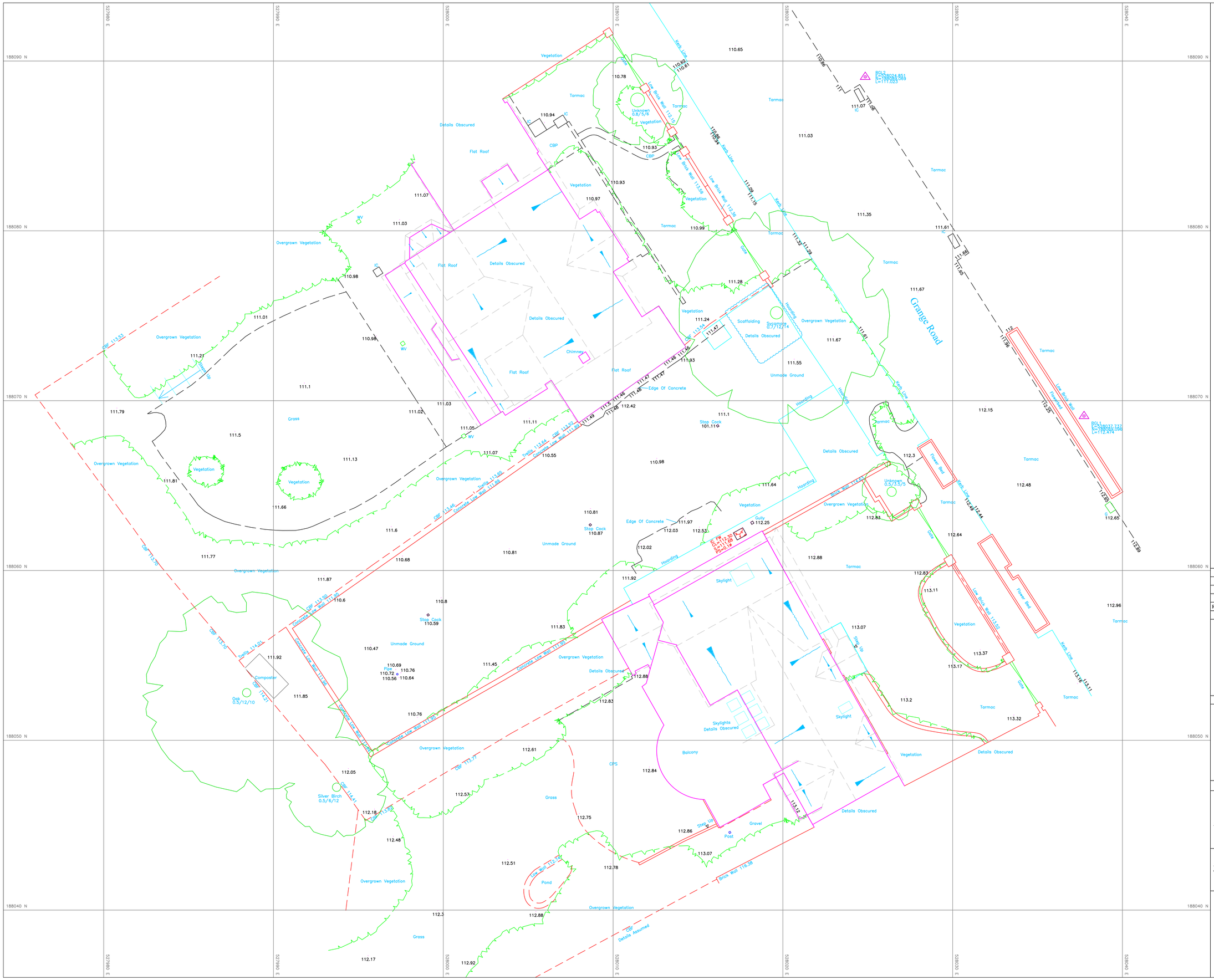
All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

Cassion Castle Architects
Unit 10 Old Dairy Court, 17 Crouch Hill, London, N4 4AP

Project: 6a Grange Road

Sheet No:	Rev:	Date: 06/06/2025
P/300	D	Scale: 1:50 A1 / 1:100 A3

Title: Front & Side Elevations



Legend

BT	British Telecom
CATV	Cable Television
CB	Control Box
CBF	Closed Board Fence
CBP	Concrete Block Paving
CL	Cover Level
CLF	Chain Link Fence
CPS	Concrete Paving Slabs
DC	Drainage Channel
DK	Drop Kerb
DP	Down Pipe
ER	Earth Rod
FB	Flowerbed
FH	Fire Hydrant
FP	Flag Pole
G	Gully
GV	Gas Valve
IC	Inspection Cover
IRF	Iron Railing Fence
IL	Invert Level
KW	Kerb Weir
LP	Lamp Post
MH	Manhole
MKR	Marker Post
P	Post
PRF	Post & Rail Fence
PS	Pipe Size
PWF	Post & Wire Fence
RE	Rodding Eye
RN	Road Name
RS	Road Sign
SY	Stay Wire
Sycamore MB	Species Max Multi Bowl
0.3/4/8	Trunk(Dia)/Spread(Dia)/Height(Approx)
TL	Traffic Light
TOB	Top of Bank
TP	Telegraph Pole
UTL	Unable To Lift
VP	Vent Pipe
WL	Water Level
WV	Water Valve
FL 0.00	Floor Level
CL 0.00	Ceiling Height/Level (metres)
FCL 0.00	False Ceiling Height/Level (metres)
BL 0.00	Beam Height/Level (metres)
SL 0.00	Spot Level
	All Arrows Indicate Direction Up
WCL 0.00	Window Cill Level
WHL 0.00	Window Head Level
DL 0.00	Door Level

Rev	Int	Date	Description

Client

Cassion Castle Architects
10 Old Dairy Court
17 Crouch Hill
London
N4 4AP

Job Title

6A Grange Road
London, N6 4AP

Site Survey

Drawn ZB	Scale 1:100 @A1
Levelling: All levels relate to OS Active GPS Network.	Date of Survey: Sept 2024
Notes: All new information has been shown on drawing, RGL-23-4044-01A.	Drawing Number: RGL-24-4230-01

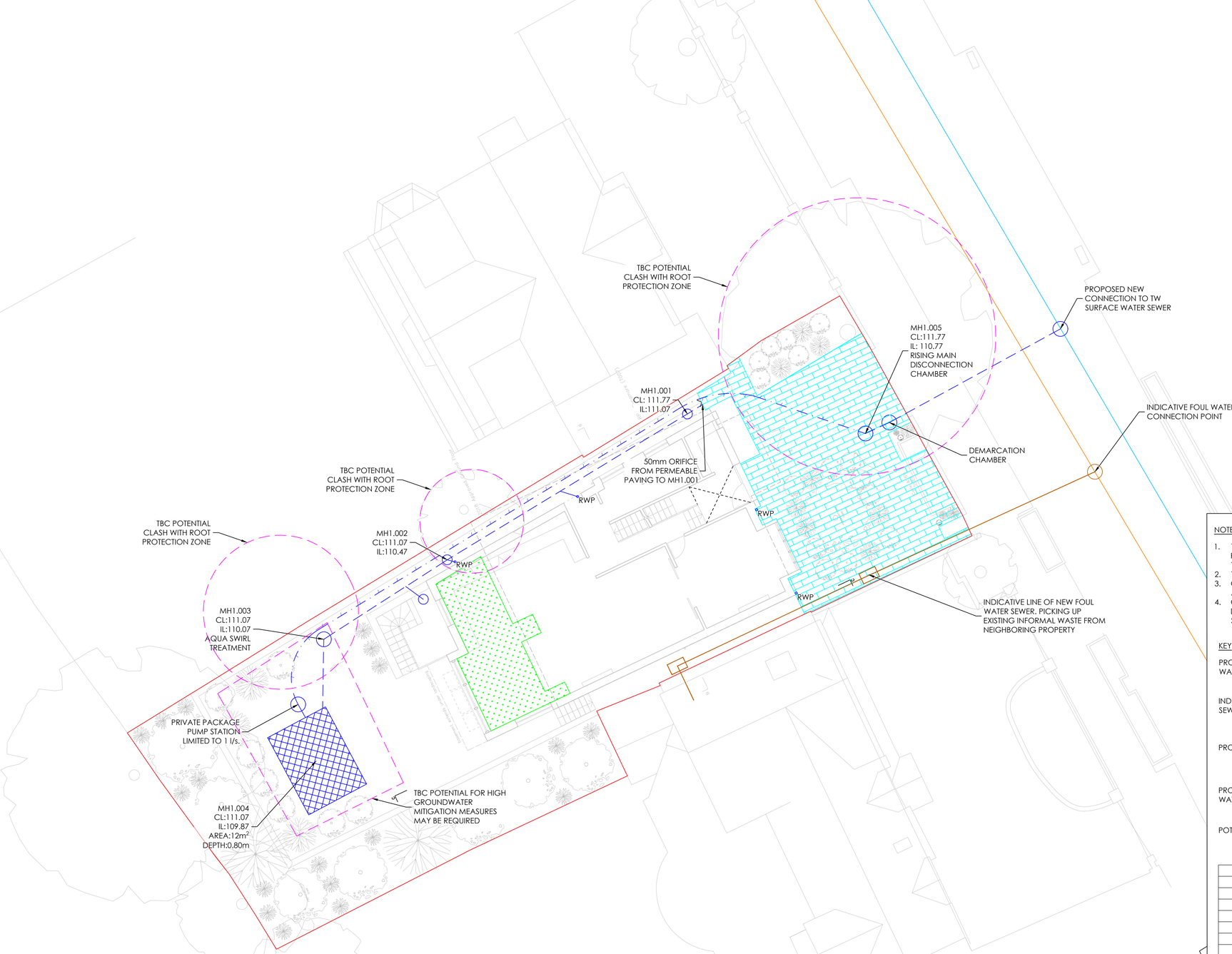
RGL Surveys Ltd
Land & Measured Building Surveyors
Building S8
Westcott Venture Park
Westcott
Bucks HP18 0XB
Tel: 01296 651833
Email: mail@rglsurveys.co.uk
www.rglsurveys.co.uk

Topographic . Measured Building . Revit . Site Engineering . Pointclouds

N

Indicative

CREATE



NOTES

1. THIS DRAWING IS BASED ON LAYOUT DRAWINGS 'GROUND FLOOR PLAN', FIRST FLOOR PLAN', SECOND FLOOR AND ROOF PLAN' AND 'BASEMENT PLAN' , ALL DATED 12/06/24. TOPOGRAPHIC SURVEY RGL-24-4230-01 BY RGL SURVEYS LTD DATED SEPTEMBER 2024.
2. TOPOGRAPHIC SURVEY COMPLETED TO MAOD.
3. CONNECTION TO PUBLIC SURFACE WATER SEWER WILL NEED TO BE CONFIRMED VIA ADDITIONAL SURVEY TO ORDNANCE DATUM.
4. CCTV DRAINAGE SURVEY WILL NEED TO BE UNDERTAKEN TO INFORM ANY EXISTING DRAINAGE SEWERS AND TO FORMALISE DRAINAGE STRATEGY AT DETAILED DESIGN STAGE.

KEY

PROPOSED SURFACE WATER SEWER		PROPOSED ATTENUATION TANK	
INDICATIVE FOUL WATER SEWER		PROPOSED TANKED PERMEABLE PAVING	
PROPOSED GREEN ROOF		APPLICATION SITE REDLINE BOUNDARY	
PROPOSED SURFACE WATER RISING MAIN		INDICATIVE RAIN WATER PIPES	⊙RWP
POTENTIAL CONSTRAINTS			

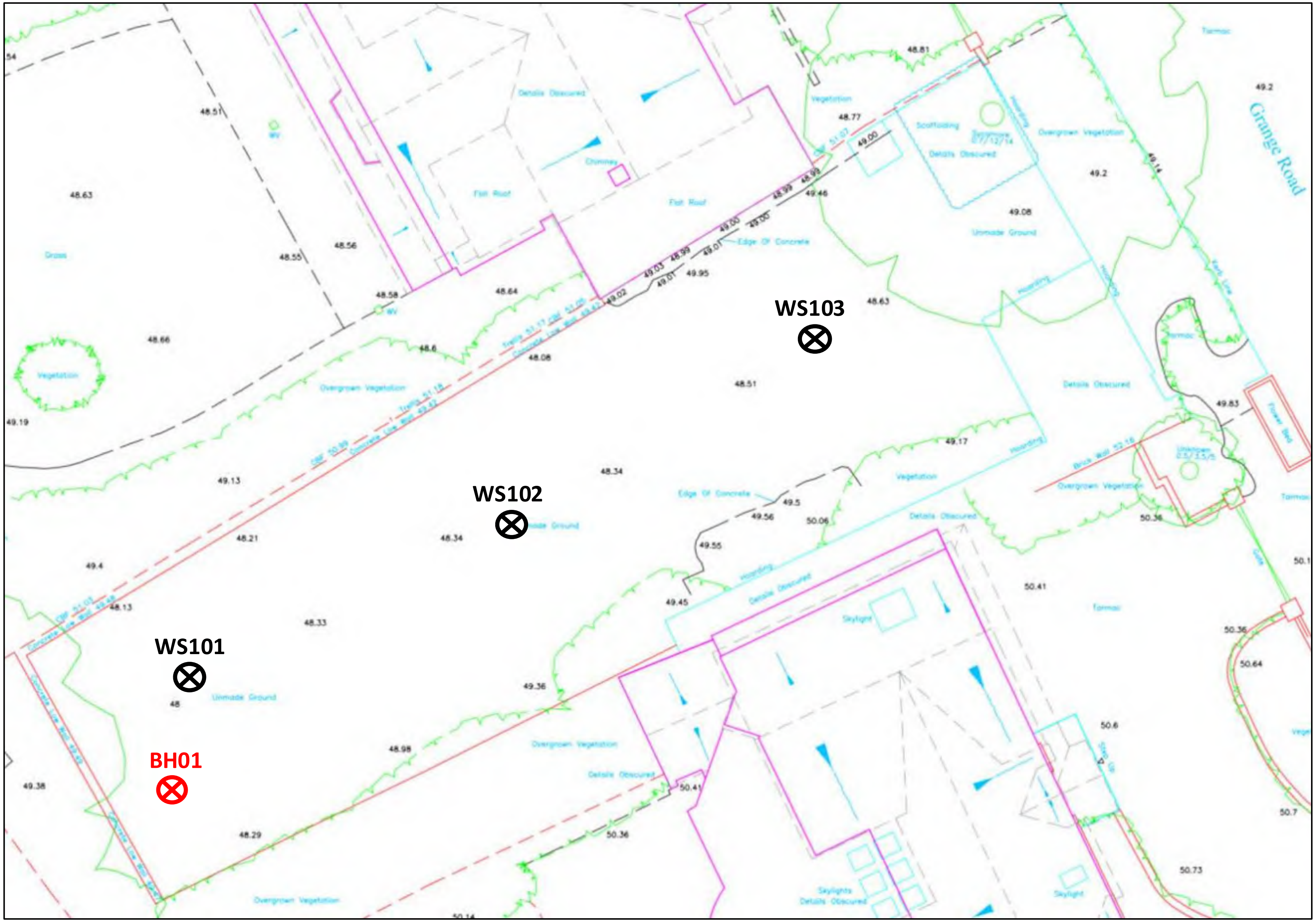
REV	DATE	AMENDMENT DETAILS	DRAWN	APPROVED
B	10.05.25	UPDATED PLANS RECEIVED '250606_Grange Road_01'.	GB	GS
A	18.09.24	REVISED DRAINAGE STRATEGY	GB	GS

PROJECT: 6A GRANGE ROAD, LONDON	DATE: 17.09.24	DRAWING STATUS: INFORMATION	
	SCALE(S): 1:100	DESIGNED: GB / DRAWN: GB	
		CHECKED: GS / APPROVED: GS	
DRAWING TITLE: SURFACE WATER DRAINAGE STRATEGY	JOB No: 2546		
CLIENT: ILYAS AMLANI	DRAWING No: 02/001	REVISION: B	

create CONSULTING ENGINEERS LTD

www.createconsultingengineers.co.uk

DO NOT SCALE ORIGINAL SHEET SIZE - A1 Landscape


WS103
WS102
WS101
BH01
Grange Road
Flat Roof
Details Obscured
Overgrown Vegetation
Unmade Ground
Edge Of Concrete
Vegetation
Grass
Tarmac
Skylight
Hoarding
Scaffolding
Chimney
48.51
48.63
48.56
48.55
48.58
48.64
48.66
48.08
48.34
48.21
48.13
48.33
48.29
48.98
49.19
49.13
49.4
49.38
49.36
49.45
49.55
49.56
49.17
49.2
49.08
49.83
50.41
50.36
50.6
50.7
50.73
50.64

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Permeable Paving	0.013	5.00	111.770	1200	0.600
1.001			111.770	1200	0.700
1.002	0.011	5.00	111.070	1200	0.600
1.003			111.070	1200	1.000
1.004			111.070	1200	1.200
1.005			111.770	1200	1.000
OUTFALL			112.220	1200	1.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
Permeable Paving	Permeable Paving	1.001	1.000	0.600	111.170	111.160	0.010	100.0	75	5.03	50.0
1.001	1.001	1.002	13.000	0.600	111.070	110.470	0.600	21.7	150	5.13	50.0
1.002	1.002	1.003	7.000	0.600	110.470	110.400	0.070	100.0	150	5.24	50.0
1.003	1.003	1.004	3.000	0.600	110.070	110.040	0.030	100.0	150	5.29	50.0
1.004	1.004	1.005	34.000	0.600	109.870	110.770	-0.900	-37.8	150	5.86	50.0
1.005	1.005	OUTFALL	9.000	0.600	110.770	110.720	0.050	180.0	150	6.06	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Permeable Paving	0.634	2.8	2.3	0.525	0.535	0.013	0.0	52	0.710
1.001	2.173	38.4	2.3	0.550	0.450	0.013	0.0	25	1.199
1.002	1.005	17.8	4.3	0.450	0.520	0.024	0.0	51	0.833
1.003	1.005	17.8	4.3	0.850	0.880	0.024	0.0	51	0.833
1.004	1.000	17.7	4.3	1.050	0.850	0.024	0.0	150	0.000
1.005	0.746	13.2	4.3	0.850	1.350	0.024	0.0	59	0.671

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Permeable Paving	1.000	100.0	75	Circular	111.770	111.170	0.525	111.770	111.160	0.535
1.001	13.000	21.7	150	Circular	111.770	111.070	0.550	111.070	110.470	0.450
1.002	7.000	100.0	150	Circular	111.070	110.470	0.450	111.070	110.400	0.520
1.003	3.000	100.0	150	Circular	111.070	110.070	0.850	111.070	110.040	0.880
1.004	34.000	-37.8	150	Circular	111.070	109.870	1.050	111.770	110.770	0.850
1.005	9.000	180.0	150	Circular	111.770	110.770	0.850	112.220	110.720	1.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Permeable Paving	Permeable Paving	1200	Manhole	Adoptable	1.001	1200	Manhole	Adoptable
1.001	1.001	1200	Manhole	Adoptable	1.002	1200	Manhole	Adoptable
1.002	1.002	1200	Manhole	Adoptable	1.003	1200	Manhole	Adoptable
1.003	1.003	1200	Manhole	Adoptable	1.004	1200	Manhole	Adoptable
1.004	1.004	1200	Manhole	Adoptable	1.005	1200	Manhole	Adoptable
1.005	1.005	1200	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Permeable Paving	111.770	0.600	1200	0	Permeable Paving	111.170	75
1.001	111.770	0.700	1200	1	Permeable Paving	111.160	75
				0	1.001	111.070	150
1.002	111.070	0.600	1200	1	1.001	110.470	150
				0	1.002	110.470	150
1.003	111.070	1.000	1200	1	1.002	110.400	150
				0	1.003	110.070	150
1.004	111.070	1.200	1200	1	1.003	110.040	150
				0	1.004	109.870	150
1.005	111.770	1.000	1200	1	1.004	110.770	150
				0	1.005	110.770	150
OUTFALL	112.220	1.500	1200	1	1.005	110.720	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	40	0	0

Node Permeable Paving Online Orifice Control

Flap Valve	x	Invert Level (m)	111.170	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.050		

Node 1.004 Online Pump Control

Flap Valve	x	Design Depth (m)	1.215	Switch off depth (m)	0.005
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	109.870	Switch on depth (m)	0.010		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.005	1.000	5.000	1.000

Node Permeable Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	111.170	Slope (1:X)	300.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	24	Depth (m)	0.470
Safety Factor	2.0	Width (m)	8.800	Inf Depth (m)	
Porosity	0.30	Length (m)	8.800		

Node 1.004 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	109.870
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	140

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.0	0.0	0.800	12.0	0.0	0.801	1.2	0.0	1.200	1.2	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	Permeable Paving	23	111.214	0.044	2.0	0.7381	0.0000	OK
30 minute summer	1.001	23	111.084	0.014	0.7	0.0159	0.0000	OK
15 minute summer	1.002	11	110.509	0.039	2.4	0.0438	0.0000	OK
15 minute summer	1.003	11	110.110	0.040	2.4	0.0455	0.0000	OK
120 minute summer	1.004	78	109.912	0.042	1.5	0.5232	0.0000	OK
15 minute summer	1.005	14	110.799	0.029	1.0	0.0323	0.0000	OK
15 minute summer	OUTFALL	14	110.748	0.028	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Permeable Paving	Orifice	1.001	0.7				
30 minute summer	1.001	1.001	1.002	0.7	0.537	0.018	0.0264	
15 minute summer	1.002	1.002	1.003	2.4	0.681	0.134	0.0244	
15 minute summer	1.003	1.003	1.004	2.4	0.662	0.133	0.0107	
120 minute summer	1.004	Pump	1.005	1.0				
15 minute summer	1.005	1.005	OUTFALL	1.0	0.436	0.076	0.0206	1.8

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	Permeable Paving	24	111.329	0.159	8.5	3.5059	0.0000	SURCHARGED
30 minute summer	1.001	25	111.093	0.023	1.9	0.0258	0.0000	OK
15 minute summer	1.002	11	110.555	0.085	9.5	0.0960	0.0000	OK
120 minute summer	1.003	124	110.448	0.378	5.0	0.4280	0.0000	SURCHARGED
120 minute summer	1.004	124	110.448	0.578	5.0	7.2464	0.0000	SURCHARGED
15 minute summer	1.005	11	110.799	0.029	1.0	0.0323	0.0000	OK
15 minute summer	OUTFALL	11	110.748	0.028	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Permeable Paving	Orifice	1.001	1.9				
30 minute summer	1.001	1.001	1.002	1.9	0.787	0.050	0.0719	
15 minute summer	1.002	1.002	1.003	9.4	0.969	0.531	0.0680	
120 minute summer	1.003	1.003	1.004	5.0	0.804	0.282	0.0528	
120 minute summer	1.004	Pump	1.005	1.0				
15 minute summer	1.005	1.005	OUTFALL	1.0	0.436	0.076	0.0206	7.7

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Permeable Paving	42	111.392	0.221	8.4	5.0172	0.0000	SURCHARGED
60 minute summer	1.001	42	111.095	0.025	2.3	0.0283	0.0000	OK
180 minute summer	1.002	184	110.987	0.517	5.5	0.5845	0.0000	FLOOD RISK
180 minute summer	1.003	184	110.987	0.917	5.4	1.0366	0.0000	FLOOD RISK
180 minute summer	1.004	184	110.986	1.116	5.1	10.7484	0.0000	FLOOD RISK
15 minute summer	1.005	11	110.799	0.029	1.0	0.0323	0.0000	OK
15 minute summer	OUTFALL	10	110.748	0.028	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	Permeable Paving	Orifice	1.001	2.3				
60 minute summer	1.001	1.001	1.002	2.3	0.758	0.060	0.1161	
180 minute summer	1.002	1.002	1.003	5.4	0.848	0.306	0.1232	
180 minute summer	1.003	1.003	1.004	5.1	0.775	0.285	0.0528	
180 minute summer	1.004	Pump	1.005	1.0				
15 minute summer	1.005	1.005	OUTFALL	1.0	0.436	0.076	0.0206	10.5

APPENDIX E

Arboricultural Impact Assessment Report

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

ARBORICULTURAL IMPACT ASSESSMENT AND METHOD STATEMENT

06 Grange Road, London, N6 4AD

Report by

Michal Mixa FdSc.

FdSc. MArborA

On the instructions of Ilyas Amlani

10/25/22

Please Note:

The tree report has been amended by Cassion Castle Architects to depict the most recent iteration of the design proposal.

Please find below a schedule of amendments to the tree report:

Schedule of Amendments

Page	Description	Date
8	Updated ground floor/landscape plan insert	10 June 2024
Appendix 4	Updated plan to show footprint extent of most recent design proposal	10 June 2024
Appendix 5	Updated plan to show footprint extent of most recent design proposal	10 June 2024

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

1 Report summary

1.1 MMARBORICULTURE LTD was instructed by **Ilyas Amlani** to provide BS5837 compliant tree survey and Arboricultural Report to accompany the planning application for the site at **06 Grange Road, London, N6 4AD** to develop **detached house with landscape design and associated infrastructure**.

1.2 Total number of **18** trees was identified from which **None** tree of High Amenity Value (A Category) ; **4** trees of Medium Amenity Value (B Category); **14** trees of Low Amenity Value (C Category) and **None** trees of Unsuitable for retention (U Category).

1.3 **T009 - T011** require removal to facilitate the proposal and new landscape scheme.

1.4 **T007 and T008 (total area of approx. 69.5m2)** RPAs will require a 3-dimensional confinement system to facilitate the proposed hard standing.

1.5 **T007 (approx. 18m2 or 6.2% of total RPA) and T008 (approx. 19.6m2 or 8.8% of total RPA)** will be impacted by the proposed **foundation**; as such, the site investigation will have to take place to understand root morphology, prior development works commencement. The specialist construction methods such as pile and beam will likely be employed.

1.6 All retained trees (**T007**) will be protected from damage by the erection of 2m high fencing at the edge of their Root Protection Areas (RPAs).

1.7 The development proposal will have a little or negligible impact on the retained trees or their wider contribution to an area character if the methods detailed in this report will be followed.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

2 Introduction and report background

2.1 Instruction

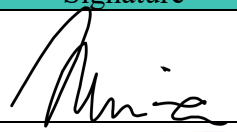
2.1.1 MMARBORICULTURE has been instructed by Ilyas Amlani to carry out a tree survey and produce the Arboricultural report in support of a planning application for the site at 06 Grange Road, London, N6 4AD.

2.1.2 MMARBORICULTURE LTD was instructed to carry out a survey of all trees on or immediately adjacent to the proposed development site and to consider the impact of the development on the trees, including which trees should be removed, which ones are suitable for retention and how trees to be retained will be protected during the development, if approved. The means of tree protection is set out in the Arboricultural Method Statement at Section 4.

2.1.3 The report produced following principles of British Standard BS5837:2012 Trees in relation to design, demolition, and construction – Recommendations. The Section 4 Arboricultural Method Statement specifies the principles which need to be adopted during the demolition and construction of the development. The survey covers trees of a 75mm or above trunk diameter and any significant vegetation on the development site. Although any specific activities proposed in RPAs may require agreement by Local Planning Authority (LPA) if requested in the reserved matters stage.

2.1.4 The British Standard 5837: 2012 *Trees in relation to design, demolition, and construction – Recommendations* is recognised standard under the National Policy Planning Framework (NPPF) considering trees in the planning process. It provides a methodology of tree categorisation to inform which trees are suitable for retention. It also provides the options for the tree protection of retained trees during the development works and their sustainability for the proposal.

2.1.5 The author of this report is Michal Mixa FdSc. MarborA, Director of MMARBORICULTURE LTD, who started his career as a ground person for a tree management company in Southwest London and progressed to the lead climbing arborist. After five years. He started his first technical role as a Tree Officer in the London Borough of Southwark and developed his knowledge and skills to become an Arboricultural consultant. He is a holder of the FdSc in Arboriculture and has five years of technical experience Methodology

Author	Position	Date	Signature
Michal Mixa FdSc	Director/ Arboricultural Consultant	***10/25/22***	

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

2.2 Methodology

2.2.1 All measurements were made from ground level using a laser for measuring height, diameter tape to measure trunk diameters etc, but where access was limited dimensions were estimated.

2.2.2 All trees were graded following BS5837 tree survey guidance:

- Category **A** – trees of high quality and value, with an estimated life expectancy of 40 years.
- Category **B** – trees of moderate quality and value. An estimated life expectancy of at least 20 years.
- Category **C** – trees of lower quality and value. An estimated life expectancy of at least 10 years, with a stem diameter of up to 150mm measured at 1.5m from ground level.
- Category **U** – dead, dying or unsuitable for retention. Life expectancy of less than 10 years.

2.3 Limitation

2.3.1 The survey was undertaken from the ground level using essential tools without detailed investigations. The data collected can be found in the tree schedule in Appendix 2.

2.3.2 The tree condition can rapidly change due to unpredictable factors, such as climatic and artificial events as such reinspection shall be made if such circumstance occur or 2 years after the initial survey if required for the planning application as per BS5837 guidance.

2.4 Supporting Documents

2.4.1 Supporting documents provided by the client are summarised in the table below (Table 1).

Document purpose	Reference Number
Proposed Floor Plan (landscape)	*GRANGE ROAD 1 50 02*
OS Tile (downloaded from Mapserve.co.uk and supplied by MMARBORICULTURE LTD)	06a-Grange-Road-London-N6-4AD (source Mapserver.co.uk)

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

3 The site

3.1 The site

3.1.1 The site visit was conducted on **19th October 2022** to undertake the survey.

3.1.2 The site comprises residential dwelling in densely urbanised neighbourhoods. Figure 1 shows the site in situ.

Figure 1 Site in situ highlighted green (Landtech ltd)

3.2 Soil

3.2.1 According to British Geological Survey data the site is dominated by soils including clay particles (Figure 2), as such specialist consideration shall be made to design the foundations.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Figure 2 Screenshot of British Geological Survey online mapping system showing site soil composition.(bgs.org.uk)

3.3 Legal constraints

3.3.1 I conducted online search with the Local Planning Authority, Haringey, (LPA), which confirmed that the site location is located within Conservation Area (CA). The search was unable to confirm if the site is a subject the Tree Preservation Order (TPO), as such request to LPA shall be made prior commencing any tree works.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

4 Arboricultural impact statement

4.1 The proposal

4.1.1 The latest proposal seeks the development of detached house with landscape design and associated infrastructure (Figure 3).

Figure 3 Proposed design scheme (supplied by client)

Amended by CCA
(10 June 2024)
please refer to cover page

4.2 Tree works

4.2.1 T009 - T011 will require removal to facilitate the proposal.

4.3 Incursions and works within Root Protection Area

4.3.1 T007 (approx. 18m2 or 6.2% of total RPA) and T008 (approx. 19.6m2 or 8.8% of total RPA) will be impacted by the proposed foundation and such the specialist construction must be employed to facilitate the development avoiding disturbance and/or damage to the tree roots.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

4.3.2 Within T002 – T006 RPAs ground excavation and creation of the concrete walls of approx. 2m took place. This inevitably resulted in loss of tree root mass. The mitigation action will be required, however the proposal will have no impact on the trees as damage already occurred.

4.3.3 T007 and T008 (total area of approx. 69.5m2) RPAs will require a 3-dimensional confinement system backfilled with angular stone and final layer of porous material to the soil to facilitate the proposed hard standing to avoid compaction of the soil and allow water and air penetration to rooting environment of trees.

4.4 Tree protection measures

4.4.1 All retained trees (T007) require protection from damage by the erection of 2m high fencing at the edge of their RPAs as per the specification of BS5837:2012, detailed in section 6.2. (Location specified in Appendix 5 Tree Protection Plan).

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

4.5 Sequence of works

4.5.1 Individual stages are summarised in diagram below (Table 2).

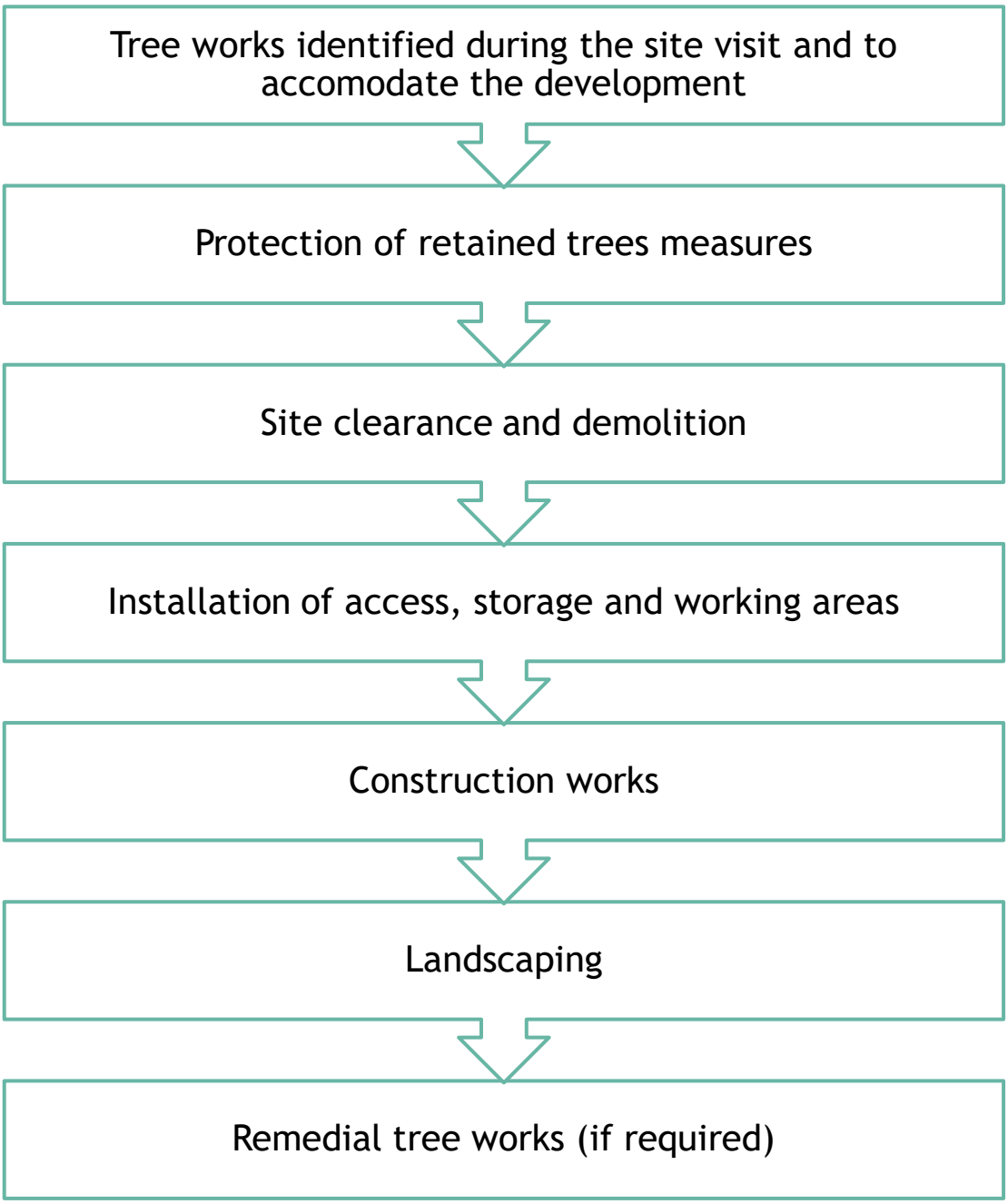


Table 1 Flow chart of individual stages for tree protection.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5 Arboricultural method statement

5.1 Tree Protection Plan

5.1.1 The attached plan (in Appendix 4) is based on the provided information and reflects the measurements and site boundaries. The plan is only relevant for dealing with tree issues. Trees to be retained have coloured centres and outlines, whilst trees removed have dashed hatching.

- The dashed line shows the protection barriers placement.
- The light blue hatching shows RPA offsets, in location already occupied by hard standing or existing structures creating obstacles for the root spread (such existing foundation, boundary walls with the foundation, roads, paving, e.g.).
- The purple hatching indicates areas of ground protection within RPA.
- The orange hatching indicates areas of specialist construction methods within RPA such as pile and beam foundation, micro-drilling, changes of levels, e.g. (as per related sections of the report and annotation on the TPP)
- The yellow hatching indicates the Construction Exclusion Zone (CEZ) areas, and any construction activity must be avoided within the zone.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5.2 Stage 1 Tree works

5.3 **T009 - T011** require removal to facilitate the proposal.

5.3.1 The tree works should be carried out in line with current British Standard BS3998:2010. It is recommended that the Arboricultural Association undertakes works approved by the contractor. A contractor must ensure that all necessary consents have been received from LPA and follow current industry standards and best practices. To minimise damage to retained trees, stumps, shrubs, and other vegetation must be removed by hand or specialised stump grinding machinery. The poisoning of stumps, if required, must be carried out by trained and qualified operatives.

5.3.2 All work should be carried out to avoid bird nesting season.

5.4 Stage 2 Installation of Tree protection measures

5.4.1 Trees can very easily be damaged during construction activities through their branches being broken by construction traffic passing close to the canopy or by root severance during the digging of foundation or service trenches. Most roots are to be found in the upper 600mm of soil and so even relatively shallow trenches can sever a significant number of roots growing across the direction of the trench. Similarly, the diameter of tree roots tapers sharply within a few metres of the trunk of a tree, so that what might seem to a site worker to be an insignificant root (perhaps only a few centimetres in diameter) may be highly important. Tree roots can also be damaged indirectly, often inadvertently, through soil compaction, which disrupts soil structure and can lead to root death through the development of anaerobic soil conditions. Spillage of toxic materials (e.g., oil or diesel) can also result in root damage and ultimately the death of a tree. Protection of the soil around trees by means of a construction exclusion zone (CEZ) is therefore vitally important to preserve roots undamaged.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5.4.2 Tree protection, to enforce the CEZ, will comprise of 2 m tall fencing installed in the positions shown in the tree protection plan before materials are delivered to site or construction commences. The fencing will consist of a scaffold framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3 m (Figure 5). Onto this, weld mesh panels or 2 m high shuttering board will be securely fixed with wire or scaffold clamps. Un-braced weld mesh panels on unsecured rubber or concrete feet will not be used as these are not resistant to impact and are too easily removed by site operatives. An alternative system of bracing which does not require a scaffold framework is shown in Figure 6. The barriers will be clearly marked by all-weather signs "Keep Out" (Figure 7).

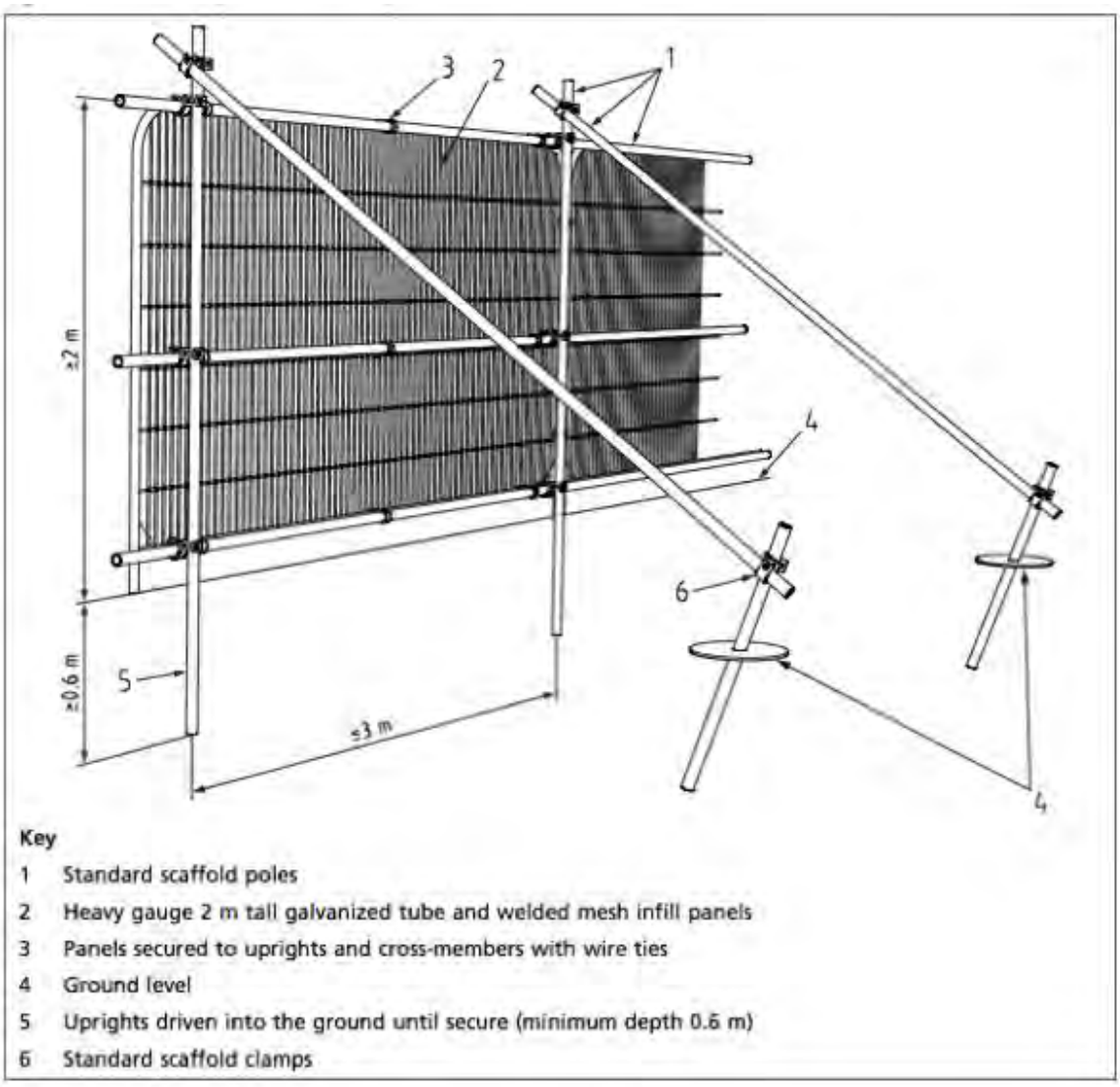


Figure 4 BS5837: 2012 default specification for barriers type

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

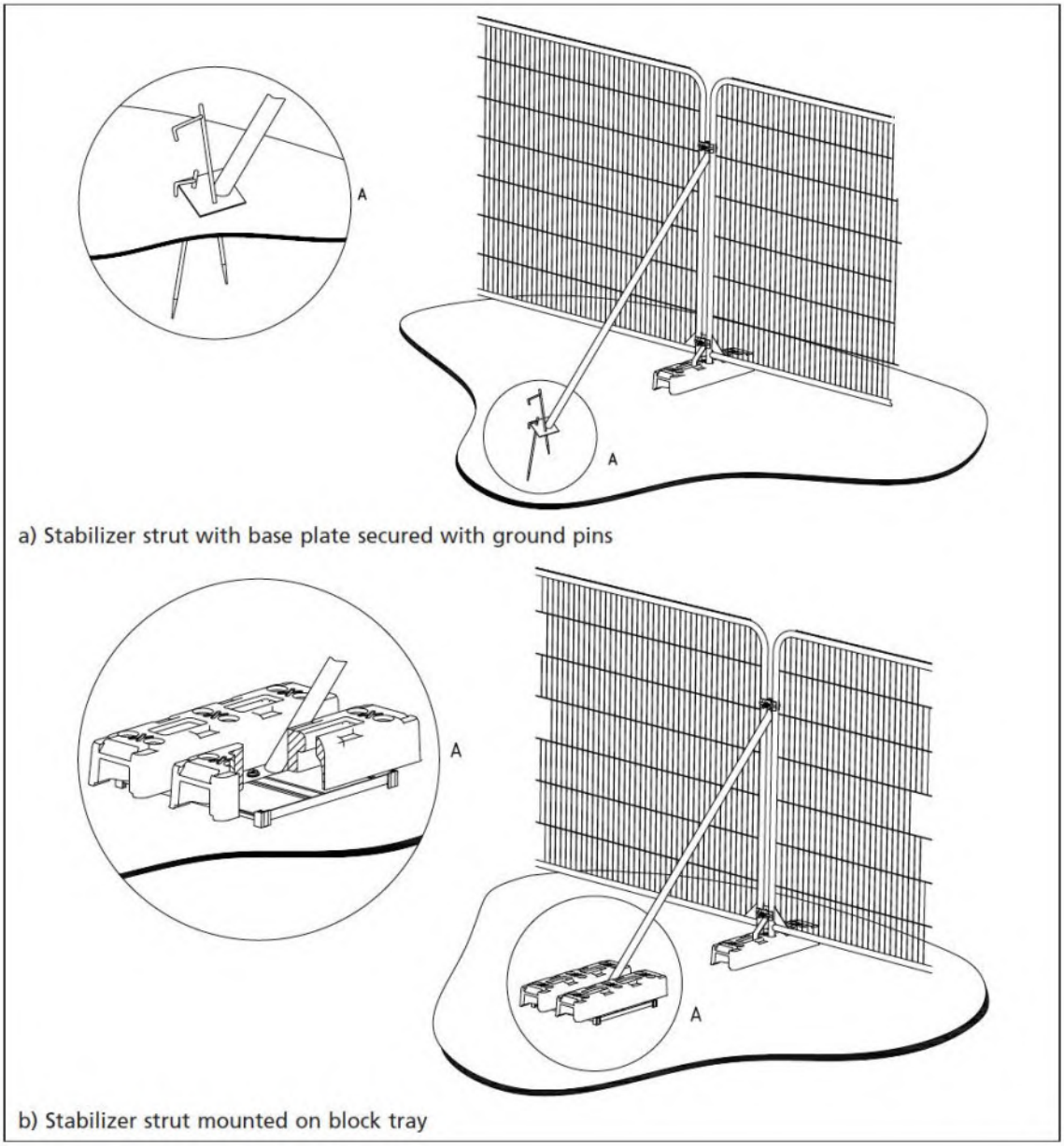


Figure 5 Above ground stabilisation system example (BS5837)

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Figure 6 All-weather protective sign example

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5.4.3 All tree protection measures will remain in place and kept in good condition until all works are complete, unless otherwise agreed with the LPA.

5.5 Stage 3 Site set-up, storage, and material mixing

5.5.1 Space must be allowed outside of RPAs for site machinery and material storage.

5.5.2 The material must be stored outside the RPAs, which applies to cement mixing and washing points. The runoff potential of the contaminants must be considered to avoid incursion to the RPA of retained trees, refer to TPP (appendix 3).

5.6 Stage 5 Incursions and works within Root Protection Area

5.6.1 T007 (approx. 18m2 or 6.2% of total RPA) and T008 (approx. 19.6m2 or 8.8% of total RPA) will be impacted by the proposed **foundation**. Arboriculturally supervised hand-dug trench along the contours of the proposed footing to 600mm depth in areas not occupied by the existing foundation of the same depth will be required to understand root morphology and evaluate if the design is achievable in Arboricultural terms. The specialist's construction methods, such as pile and beam, will be employed if the roots are identified under the proposed foundation to avoid damage to the roots and avoid soil compaction of the exposed ground to promote root development.

5.6.2 T007 and T008 (total area of approx. 69.5m2) RPAs (total of approx. [number] m2) will require a 3-dimensional confinement system back filled with angular stone and final layer of porous material allowing water and air penetration to the soil to avoid compaction and promote trees rooting environment in order to accommodate the proposed hard standing.

5.7 Stage 6 Tree Planting and soft landscaping

5.7.1 Tree protection measures in place may be removed in consultation with LPA or AC.

5.7.2 No plant or vehicles can access the soft areas of ground within RPA.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5.7.3 No Excavation can take place within RPA of retained trees except of localised post holes for fencing. If the root will be found (<25mm diameter) the hole will be backfilled and moved to another location. The procedure will be followed up until the suitable location without the root will be find.[1]

5.7.4 Proposal seek plantation as mitigation of the tree loss. At the moment of the writing the species and the location is unknown and will be confirmed at the later date. The plantation should be done away from the RPA if practicable or by using hand tools following the same principles as described in section 5.8.1. in line with guidance of BSI (2014) BS8545: Trees from nursery to independence in the landscape: Recommendations.

5.7.5 Any landscaping proposed within RPA of retained trees shall be undertaken by using hand tools to avoid compaction of the ground and disruption of the rooting environment. Turf and other soft surfaces to be introduced will be kept to a minimum thickness (maximum 100mm) and laid upon existing soft ground. If undulations need to be levelled, then sharp sand will be used and no excavation will be undertaken. Retaining structures will be installed using pile and beam construction. No strip foundations will be installed. No tree roots are allowed to be removed without written consent of project arboriculturist or LPA in case of protected trees.

5.8 Summary of the site monitoring and supervision

5.8.1 The Project Arboricultural Consultant (PAC) shall attend the site prior to the commencement of the development to ensure a satisfactory level of protective fencing and ground protection; ground-level alternations; construction of walls, installation of new surfaces within RPAs of retained trees and at least every month during the development works. Where agreed with the L.A., it may be acceptable to supply photographs of the fencing to avoid the necessity for a site visit.

Site visit	Attendees	Timing	Reason
Pre-Commencement Meeting	Site manager, Project Arborist and LPA Arboricultural officer	After completion of the tree works and installation	Check if tree protection measures satisfy the methodology detailed

[11]If concrete is to be used to secure posts in holes, then an impermeable barrier is to be used between the concrete and soil to prevent potential contamination of the soil environment to avoid damage to the tree roots.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

		of the three protective measures. Unless LPA agrees, further actions are not permitted, such as demolition or soil excavation.	in AMS and LPA expectations. Additional action is required for the protection of the trees and comments on the development
Root Investigation within T007 (approx. 18m2 or 6.2% of total RPA) and T008 (approx. 19.6m2 or 8.8% of total RPA) RPA	Project Arborist and construction contractor	Prior to the commencement of the demolition works	To determine root morphology and evaluate the need for specialist construction methods such as pile and beam, if roots are discovered, the most suitable location will be determined for piles.
Regular site monitoring and reporting	Project Arborist and Site manager	Regular site monitoring of the tree protection measures and in the event of unexpected issues during the development. The pictures of the site will be provided every two weeks[2]	To mitigate any potential issues raised during the development, control of protective measures maintenance and monitor site activity which could cause damage to the retained trees
Post Construction Meeting	Site manager, Project Arborist and LPA Arboricultural officer	After construction completion. Prior to the dismantling of tree protection measures and landscape work.	Check the condition of the retained trees and explain further restrictions if applicable.

[2] LPA may specify different frequency and report requirements. Pictures of the protective measures and site set up provided by a site manager may be acceptable by LPA to lower unnecessary site visits.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

5.8.2 All Site monitoring or supervision shall be followed by a report submission with an annotated photographic record and textual commentary on all matters of tree protection to the Local Authority, which is in breach of the Arboricultural Method Statement by act or omission. The initial site visit confirming the placement of satisfactory tree protection shall be notified to LA within five working days prior to the commencement of the development.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

6 Conclusion and recommendations

6.1.1 This report has been prepared to accompany the planning application for the site at 06 Grange Road, London, N6 4AD.

6.1.2 T009 - T011 will require removal to facilitate the proposal. None of the trees is of High or Medium amenity value, and as such, their removal presents no constraints to the development according to BS5837.

6.1.3 T007 and T008 (total area of approx. 69.5m2) RPAs will require a 3-dimensional confinement system to facilitate the proposed hard standings to avoid compaction and allow water and air penetration to the soil.

6.1.4 T007 (approx. 18m2 or 6.2% of total RPA) and T008 (approx. 19.6m2 or 8.8% of total RPA) will be impacted by the proposed demolition and the proposed foundation; as such, the specialist's construction methods such as pile and beam will have to be employed if tree roots are identified along with the envelope of the proposed footings.

6.1.5 Within T002 – T006 RPAs ground excavation and creation of the concrete walls of approx. 2m took place. This inevitably resulted in loss of tree root mass. The remedial action will be required especially in case of T002 which is reasonably prominent tall tree in its environment exposed. The tree shall be reduced by at least 30% of the crown mass to retain the tree and give it a chance to re-establish structural integrity. This also applies for T006, which is also more prominent tree and more exposed to the wind force. Rest of the trees are shaded and although the root severance was significant the crown reduction should not exceed 20% of total crown mass. All trees will require annual reinspection by independent Arboricultural consultant with access to the base of the trees to ensure structural stability. The first inspection shall take place within 3 months of publication of this report, as the tree assessment produced was limited by access. The inspection may conclude different tree works recommendation outcome such the above recommendation should be deemed as preliminary.

6.1.6 All retained trees (T007) will require tree protection barriers around the RPAs.

6.1.7 Provided precautions to protect the identified trees are specified and implemented through the measures included in this report; the development proposal will have little or negligible impact on the retained trees or their wider contribution to an area amenity and character if the methods detailed in this report will be followed.

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Appendix 1 – References

1. British Geological Survey (2014). http://mapapps.bgs.ac.uk/geologyofbritain/home.html. BGS, Keyworth, Nottingham.

2. G. Mercer, A. Reeves & D. O'Callaghan. 'The Relationship between Trees, Distance to Buildings and Subsidence Events on Shrinkable Clay Soil' AB Academic Publishers 2011. Arboricultural Journal, 33, 229-245.

3. BSI (2010) BS 3998:2010 'Tree Work – Recommendations. British Standards Institute
4. BSI (2014) BS8545: Trees from nursery to independence in the landscape: Recommendations. British Standards Institute

5. BSI (2012) BS5837: Trees in Relation to Design, Development and Construction: Recommendations. British Standards Institute

6. BSI (2014) BS8545: Trees from nursery to independence in the landscape: Recommendations. British Standards Institute

7. BSI (2015) BS 8596:2015 – Surveying For Bats In Trees And Woodland. British Standards Institute

8. National joint utilities group (2007) NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees

9. The National Archives (2017) Town and Country planning act, 1990, http://www.legislation.gov.uk/ukpga/1990/8/contents; Accessed 20.02.2017

10. Trees and design action group (2014) Trees in a hard landscape: Guide for delivery

11. Department for Communities and Local Government (2014) Tree Preservation Orders and trees in conservation areas

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Appendix 2: Tree Schedule

Data collected for each tree includes the following information:

- Sequential reference number, i.e., T001, T002, T003 etc.
- Species:
    - Common Name
    - Botanical Name in Latin
- Measurements:
    - Height (in meters).
    - Stem diameter (in millimetres).
    - Ground clearance, representing a level of first significant branching or canopy
    - Life stage (Young, Semi Mature, Early Mature, Mature, Veteran).
    - Estimated remaining contribution (>10 years, 10 + years, 20 + years, 30+ years, 40 + years).
- Branch Spread, recorded in meters at the extents of the 4 Cardinal Points, i.e., North, East, South & West.
- General Observations
- Retention Category
- Root Protection Area:
    - Radius (in meters)
    - Area (in square meters)
- Structural and Physiological Condition (Good, Fair, Poor, Dead).
- Preconstruction recommendations in the context of the site's current use during and after the development.
- Bat Potential (No potential, Low, Medium, High, Confirmed)

BS5837 Report

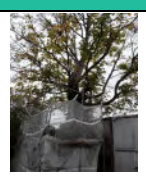
Ilyas Amlani
06a-grange-road-london-n6-4ad

Retention Category	No. trees
B	4
C	14
Total	18

Rem. Contrib.	No. trees
20+ Years	4
30+ Years	10
40+ Years	3
50+ Years	1

MMARBORICULTURE

Ref.	Species	Full Structure	Measurements	General Observations	Retention Category	RPA	Measurements2	Photo
T001	Elder *(Sambucus nigra)*	Tree 3 stems	Height (m): 5 3 stems, diam(mm): 120, 100, 90 Spread (m): 2.5N, 2.5E, 2.5S, 2.5W Crown Clearance (m): 0.5 Lowest Branch (m): 1(NE) Life Stage: Early Mature Rem. Contrib.: 20+ Years	On the neighbouring property behind the perimeter fence. Imbeded ded tree within. Cavity on the dead tree. Imbalanced Crown.	C3	Radius: 2.2m. Area: 15 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Fair Bat Habitat: Medium	
T002	Lombardy Poplar *(Populus nigra italica)*	Tree	Height (m): 18 Stem Diam (mm): 800 Spread (m): 3N, 4.5E, 4.5S, 4.5W Crown Clearance (m): 4 Lowest Branch (m): 2(N) Life Stage: Mature Rem. Contrib.: 30+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Weak Forks. Cavities on Stem. Codominant stems. Recently excavated within RPA.	C1,3	Radius: 9.6m. Area: 290 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Fair Structural Cond: Poor Bat Habitat: High	
T003	Pedunculate Oak *(Quercus robur)*	Tree	Height (m): 14 Stem Diam (mm): 700 Spread (m): 6N, 6E, 6S, 6W Crown Clearance (m): 1 Lowest Branch (m): 2(W) Life Stage: Early Mature Rem. Contrib.: 50+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Leaning Stem. Recent excavation within RPA.	B1,3	Radius: 8.4m. Area: 222 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Fair Structural Cond: Fair Bat Habitat: Low	
T004	English Yew *(Taxus baccata)*	Tree	Height (m): 6 Stem Diam (mm): 600 Spread (m): 5N, 5E, 5S, 5W Crown Clearance (m): 0 Lowest Branch (m): 1(N) Life Stage: Early Mature Rem. Contrib.: 40+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Weak Forks. Recently excavated within RPA.	B1,3	Radius: 7.2m. Area: 163 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Fair Bat Habitat: Medium	
T005	Cotoneaster *(Cotoneaster sp.)*	Tree 4 stems	Height (m): 5 4 stems, diam(mm): 80, 80, 100, 90 Spread (m): 2.5N, 2.5E, 2.5S, 2.5W Crown Clearance (m): 0 Lowest Branch (m): 0(N) Life Stage: Early Mature Rem. Contrib.: 20+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Ornamental shrub. Multistem. Recently excavated within the RPA.	C3	Radius: 2.1m. Area: 14 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Fair Structural Cond: Fair Bat Habitat: No Potential	
T006	Goat Willow *(Salix caprea)*	Tree 5 stems	Height (m): 8 5 stems, diam(mm): 110, 120, 100, 100, 100 Spread (m): 2N, 3E, 2S, 3W Crown Clearance (m): 2 Lowest Branch (m): 0.5(N) Life Stage: Early Mature Rem. Contrib.: 20+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Multistem. Recently excavated within the RPA.	C3	Radius: 2.9m. Area: 26 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Fair Bat Habitat: No Potential	

Ref.	Species	Full Structure	Measurements	General Observations	Retention Category	RPA	Measurements2	Photo
T007	Sycamore *(Acer pseudoplatanus)*	Tree	Height (m): 11 Stem Diam (mm): 800 Spread (m): 6.5N, 6.5E, 6.5S, 6.5W Crown Clearance (m): 3 Lowest Branch (m): 3(E) Life Stage: Mature Rem. Contrib.: 40+ Years	Ivy on the Stem. Minor Deadwood. Cavities on the stem.	B1,3	Radius: 9.6m. Area: 290 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Fair Structural Cond: Good Bat Habitat: High	
T008	Horse Chestnut *(Aesculus hippocastanum)*	Tree	Height (m): 7 Stem Diam (mm): 700 Spread (m): 4N, 4E, 4S, 4W Crown Clearance (m): 4 Lowest Branch (m): 4(S) Life Stage: Mature Rem. Contrib.: 40+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. High standing Coppice. Stem cavities.	B3	Radius: 8.4m. Area: 222 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Fair Structural Cond: Fair Bat Habitat: High	
T009	Buddleia *(Buddleia sp.)*	Tree 4 stems	Height (m): 2 4 stems, avg.(mm): 70 Spread (m): 3N, 3E, 1S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(E) Life Stage: Early Mature Rem. Contrib.: 20+ Years	Self set tree.	C3	Radius: 1.7m. Area: 9 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Good Bat Habitat: No Potential	
T010	Birch *(Betula sp.)*	Tree	Height (m): 3 Stem Diam (mm): 70 Spread (m): 2N, 2E, 1S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(N) Life Stage: Young Rem. Contrib.: 30+ Years	Self set young tree,	C1	Radius: 0.8m. Area: 2 sq m.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Good Bat Habitat: No Potential	
T011	Goat Willow x3 *(Salix caprea)*	Group 3 trees	Height (m): 2 3 stems, avg.(mm): 70 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 0 Lowest Branch (m): 0(N) Life Stage: Young Rem. Contrib.: 30+ Years	Self set trees.	C2	Area: 13 sq m, plus a 1m buffer.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Good Bat Habitat: No Potential	
T012	Laurel Cherry x5 *(Prunus laurocerasus)*	Group 5 trees	Height (m): 2 5 stems, avg.(mm): 100 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Early Mature Rem. Contrib.: 30+ Years	On the neighbouring property behind the perimeter fence. Data and location Estimated. Formally maintained hedge.	C2,3	Area: 44 sq m, plus a 1m buffer.	Other Reference: Distance1: Distance2: Physiological Cond: Good Structural Cond: Good Bat Habitat: No Potential	

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Appendix 3: Tree Constraints Plan

06A Grange Road, London, N6 4AD

Ilyas Amalani

Tree Survey & Protection Plan

1 of 1	Scale 1:100 @ A0	Date 24.10.2022

- Category A – trees of high quality and value
- Category B – trees of moderate quality and value
- Category C – trees of low quality and value
- Category U – trees of unsuitable for retention
- Group of trees / hedgerows
- Root protection area

GRID NORTH

N

GRANGE ROAD

T001
T002
T003
T004
T005
T006
T007
T008
T009
T010
T011
T012

1
2
4
4
6
8

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Appendix 4: Tree Removal And Retention Plan

GRID NORTH

N

4

9

10

8

4

GRANGE ROAD

T007

T006

T005

T009

T008

T004

T010

T003

T011

T012

T002

T001

06 Grange Road, London, N6 4AD

Ilyas Amlani

Tree Removal and Retention Plan

1 of 1	Scale 1:100 @ A0	Date 24.10.2022

Category A – trees of high quality and value

Category B – trees of moderate quality and value

Category C – trees of low quality and value

Category U – trees of unsuitable for retention

Group of trees / hedgerows

Root protection area

Trees to be removed

Basement Footprint (below ground)

Ground Floor Footprint (above ground)

Amended by CCA
(10 June 2024)
please refer to cover page

MMARBORICULTURE LTD
82A James Carter Road
Mildenhall Suffolk IP28 7DE
United Kingdom
Tel.: 020 8059 4245
Email: info@mmarboriculture.co.uk
Web: www.mmarboriculture.com

Appendix 5: Tree Protection Plan

06A Grange Road, London, N6 4AD

Ilyan Amlani

Tree Survey & Protection Plan

1 of 1	Scale 1:100 @ A0	Date 25.10.2022

- Category A – trees of high quality and value
- Category B – trees of moderate quality and value
- Category C – trees of low quality and value
- Category U – trees of unsuitable for retention
- Group of trees / hedgerows
- Root protection area
- RPA Offset
- Tree protective barriers
- Ground Root Protection
- Specialists Construction Methods
- Construction Exclusion Zone
- Basement Footprint (below ground)
- Ground Floor Footprint (above ground)

Amended by CCA
(10 June 2024)
please refer to cover page

GRID NORTH

N

T001
T002
T003
T004
T005
T007
T008
T012

4.6250
1.6469
1.2908
5.6608
6.8967
8.5831
5.3413
7.6045

These sections were removed due to unsympatetic construction works. Mitigation plan offered in the report Conclusion section

Tree protection fencing wont be required, as the recent unsympathetic works created artificial barier protecting trees remaining RPAs

GRANGE ROAD

2
4
6
8
10