Surface water and flood risk assessment

115-119 Goldhurst Terrace

Camden

NW6 3EY

Surface Water and Flood Risk Assessment

project no. WE16021

revision: P1

Document Control

issue no.	01	remarks:	Planning application for development at 115 – 119 Goldhurst Terrrace				
revision:	P1	prepared by:	Agnes Gannon	checked by:	Guy Laister	approved by:	Guy Laister
date:	09/06/16	signature:		signature:		signature:	

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Executive Summary

The site located at 115-119 Goldhurst Terrace is currently occupied by residential accommodation and associated landscaped garden area. The proposals are for demolition of the existing building and construction of a new 4 storey building of larger footprint, with an associated basement over the new increased footprint. This will require excavation over the entire footprint of the new building, which will extend into the rear garden to accommodate the increased building footprint and basement light wells. Excavation into the front garden will also be required for construction of 2 no. light wells. The building is to be converted into a number of flats, with a communal entrance-way.

The Environment Agency flood zone maps indicate that the site is located in Flood Zone 1 (Low Risk). In accordance with the Flood Risk and Coastal Change Guidance[1] to the National Planning Policy Framework (NPPF), this zone comprises land assessed as "having a less than 1 in 1000 annual probability of river or sea flooding" (<0.1%). Local planning guidance on basement developments specifies that all new basement developments located in borough-defined areas at risk of surface water and sewer flooding need to be accompanied by a Flood Risk Assessment. Furthermore, the London Borough of Camden SFRA indicates that the site is located in a "local flood risk zone" within an identified Critical Drainage Area (CDA), and paragraph 8.58 of the London Borough of Camden Draft Local Plan requires a Flood Risk Assessment (FRA) in this instance.

All sources of flooding have been assessed in accordance with the NPPF. Goldhurst Terrace flooded in 1975 and 2002 from surface water, however, the site itself is raised above the adjacent road levels of Goldhurst Terrace. Therefore, the risk of surface water and sewer flooding to the site are considered to be low.

The new development and associated basement is at low risk of flooding from all sources and is considered acceptable in the context of flood risk. Furthermore, surface water runoff from the site will not increase following development due to the implementation of SuDS at the site, and there will be no increase in flood risk elsewhere in the borough as a result of the development.

[1] http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/, Accessed 08/06/2016

1.0 Introduction

General Information

1.1 The site is located at 115-119 Goldhurst Terrace in the London Borough of Camden (LBC) and is currently occupied by residential housing. The site is less than 1ha in size and in its existing state comprises the building footprint, consisting of residential accommodation, and associated gardens.

1.2 The Environment Agency flood zone maps indicate that the site is located in Flood Zone 1. This zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding (<0.1%).

1.3 The LBC policy dictates that surface water and flood risk is considered in this case primarily due to basement construction. Furthermore, the site is located within a CDA in an area identified as a "Local Flood Risk Zone" (LFRZ), therefore, a Flood Risk Assessment is required. The London Borough of Camden SFRA[2] defines a LFRZ as:

"…discrete areas of flooding that do not exceed the national criteria for a 'Flood Risk Area' but still affect houses, businesses or infrastructure. A LFRZ is defined as the actual spatial extent of predicted flooding in a single location"

This Surface Water and Flooding Risk Assessment has been produced to assess the risks of flooding from other potential sources such as overland flow, groundwater, artificial water bodies and underground sewers. The impact of the proposed development on surface water infrastructure is considered, to form part of the Basement Impact Assessment (BIA).

1.4 In addition, according to The Town and Country Planning (Development Management Procedure) (England) Order 2015, the Lead Local Flood Authority (LLFA) is now the statutory consultee regarding surface water drainage of a major development. The LLFA for the site is LBC.

1.5 The proposed development falls under the classification of major development. Major development is defined in the Planning Practice Guidance[3] as:

"in respect of residential development, the provision of 10 or more dwellings or a site of 0.5 hectares or more"

This development involves the provision 10 dwellings.

Planning Policy

1.6 As part of the Local Development Framework (LDF), Camden adopted the Core Strategy and Development Policies on the 8th November 2010. The Core Strategy and Development Policies are to guide development in the borough up to 2025. The sections of Policy CS13 that relate to this site include:

- *making sure development incorporates efficient water and foul water infrastructure;*
- *requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and down-stream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross.*

1.7 The Development Policies include a policy on water, DP23, which contributes to the implementation of CS13. The requirements of DP23 include:

[2] London Borough of Camden, Strategic Flood Risk Assessment – URS, July 2014

[3] http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/, Accessed 08/06/2016

- *incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;*
- *limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined above and other sustainable urban drainage methods to reduce the risk of flooding;*
- *reducing the pressure placed on the combined storm water and sewer network from foul water and surface water run-off and ensuring developments in the areas identified… as being at risk of surface water flooding are designed to cope with the potential flooding;*
- *ensuring that developments are assessed for upstream and downstream groundwater flood risks in areas where historic underground streams are known to have been present; and encouraging the provision of attractive and efficient water features.*

1.8 The Development Policies also include a policy specific to basements as follows:

DP27 – Basements and Lightwells

"...The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability...."

1.9 The Camden Local Plan[4], which is currently in draft format, refers to "Policy A5 Basements". The sections of relevance to flooding include:

"… the proposal would not cause harm to… water conditions of the area" and

"The Council would require applicants to demonstrate that proposals for basements… avoid adversely affecting drainage and run-off or causing damage to the water environment"

1.10 The LBC has strict policies with regards to basement development within the Borough and have provided guidelines for 'New basement developments and extensions to existing basement accommodation[5]'. Formal planning guidance[6] setting out specific criteria for assessing the impact of basement construction is also available for reference in the LBC's Planning Portal. The guidance refers to the following areas, relating to basement dwellings;

- *BIA, principal impacts of basements, planning and design considerations, and*
- *how basement dwellings maybe affected in streets at risk of flooding*

1.11 As part of the BIA, it is necessary to consider 'Surface flow and flooding'. A screening flowchart (Drawing 1, in the Appendix) addresses individual sources of potential flooding, and where a risk of flooding is present, a scoping and impact assessment need to be undertaken as appropriate. This report covers this component of the BIA.

1.12 In conjunction with ARUP, the LBC produced a 'geological, hydrogeological and hydrological study for guidance on subterranean development[7]'.

Location

1.13 The site is situated on Goldhurst Terrace in the LBC as shown in Figure 1 below.

[4] Camden Local Plan, Draft, 2016

[5] London Borough of Camden, Shaping Camden – Guidelines – New Basement Development and Extensions to Existing Basement Accommodation, February 2009

[6] London Borough of Camden – Camden Planning Guidance (CPG4) Basements and Lightwells July 2015.

[7] ARUP Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development, November 2010

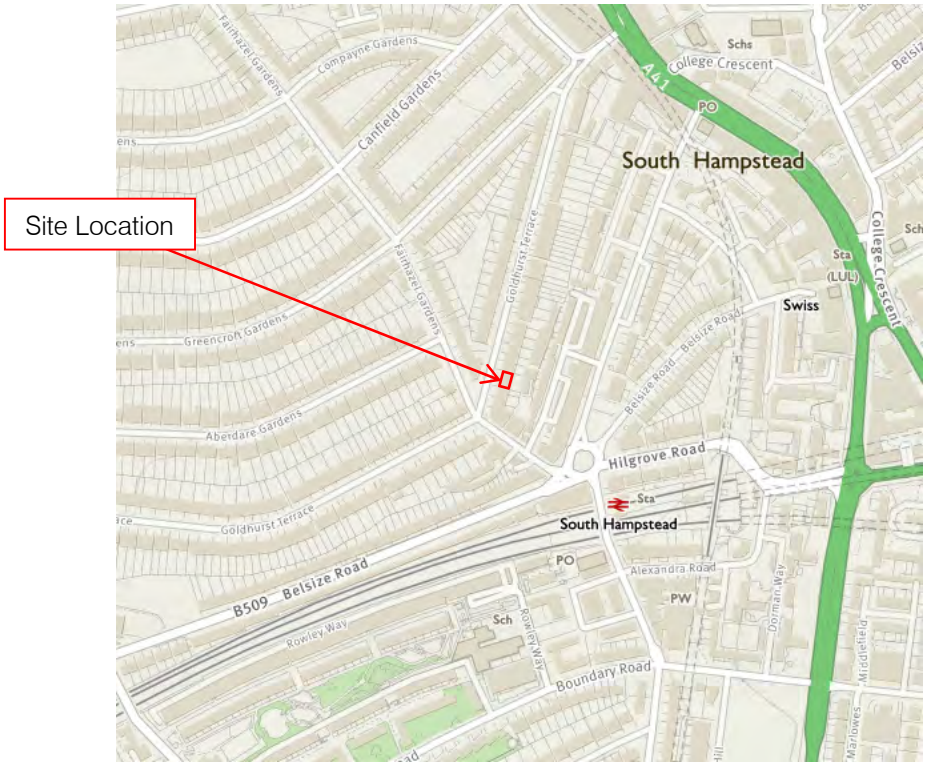


Figure 1 – Site Location[8]

Existing Development

1.14 The existing site has an area of 568m^2 (0.0568ha) which comprises of residential dwellings and associated gardens.

1.15 A topographic survey of the site was carried out by Interlock Surveys Limited in December 2015 and is included as Drawing 2 in the Appendix. The survey shows the site falls from northeast to southwest along the site. The survey was related to GPS. The survey indicates that the section of carriageway of Goldhurst Terrace that runs, along the western perimeter of the site also falling from north to south, from 38.707m to 38.398m. The ground levels surveyed at the threshold of the existing site are indicated to be at least 300mm higher than the level indicated in the Goldhurst Terrace carriageway. The eastern perimeter of the carriageway is lower, by between approximately 40mm and 100mm, than the centre of the carriageway with the pavement level adjacent to the site higher than the centre of the carriageway.

1.16 The existing entrance to the site is in the south western corner. There is a slightly raised threshold at the existing entrance by approximately 120mm to 160mm from north to south. Furthermore, during a site visit it was noted that the existing ground floor balcony was raised above the ground level, see Photograph 1 in the Appendix.

Proposed Development

1.17 Proposals are for the demolition of the existing building and construction of a new four storey residential property, with a basement level. Lightwells are proposed in the rear garden and in the front garden. The development will contain a number of new apartments with a communal entranceway, landscaping of the garden area, with an area of terracing within the back garden and a bike storage area and bin area within

[8] © Crown copyright and database rights 2016 Ordnance Survey

the front garden. The proposed access point to the front garden of the development has been moved north of the existing entrance, to the centre of the development.

2.0 Surface Water and Flooding Impact Assessment

Stage 1: Screening

2.1 CPG4[9] includes a surface flow and flooding screening flowchart for assessing the impact of potential sources of flooding, as well as the impact of the development on flood risk elsewhere.

2.2 The flow chart is set out with six questions. These questions are addressed with reference to the site and proposed development at 115-119 Goldhurst Terrace as follows:

- **Question 1a:** Is the site within the catchment of the pond chains on Hampstead Heath?

  Answer: No – The site is approximately 2km southwest of the Hampstead Heath ponds and is not shown within the catchment area of the pond chains.

- **Question 2:** As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak runoff) be materially changed from the existing route?

  Answer: No – The current proposal is to re-use the existing connections to the Thames Water combined public sewer located in Goldhurst Terrace. SuDS will be installed to maintain the run-off rate to match the existing, with attenuation to be installed in the front garden area. The basement will be positively pumped, as per paragraph 5.11 of the CPG4 Basements and Lightwells document:

  "…the council will ensure that all basement and other subterranean development is protected from sewer flooding by the installation of a positive pumped device."

- **Question 3:** Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?

  Answer: Yes – The proposed development will increase the impermeable area of the site, as the proposed building footprint is larger than the existing building footprint.

- **Question 4:** Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourse?

  Answer: No – SuDS are proposed to ensure that the surface water runoff from site is maintained at the existing rate and thus there will be no changes to the profile of the inflows of surface water being received by adjacent properties or downstream watercourse.

- **Question 5:** Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

  Answer: No – The proposed new building and associated new basement will not result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses.

2.3 According to CPG4, it is necessary to carry forward to the scoping stage of the BIA those matters of concern where the response is 'yes'. Therefore, as Questions 3 has a response of 'yes', the scoping stage is required.

2.4 In addition:

- **Question 6:** Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from

[9] CPG4, Camden Planning Guidance Basements and Lightwells, London Borough of Camden – July 2015

flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

Reference: The principles outlined in the NPPF and Planning Practice Guidance: Flood Risk and Coastal Change[10] should be followed to ensure that flood risk is not increased.

Answer: Yes – see chapter 3 for details.

Stage 2: Scoping

2.5 Increasing the area of hard standing on site as a result of development will increase the volume and peak flow rate of surface water generated. In order to ensure that development does not increase flood risk elsewhere, mitigation needs to be provided in the form of SuDS on site to attenuate the peak rate and volume of surface water runoff.

2.6 A full CCTV survey of the existing surface water drainage system was undertaken by G.O. Drainage Services Ltd. to inform the proposed drainage design. Runoff from the existing property, side patio and front driveway collects via a series of downpipes and drains to a manhole within the front garden area. This manhole connects directly to the combined sewer in Goldhurst Terrace. Following development of the property, the site will continue to drain to Goldhurst Terrace, retaining the existing 150mm diameter connection.

2.7 Drainage calculations for the site have been undertaken to accompany this application. The site for development is approximately 583m^2 in total. The development will result in an increase in formally drained, hardstanding area; from approximately 283m^2 on the existing site to 460m^2. This equates to an increase in impermeable area of the site from approximately 49% to 79%. It is proposed to reduce flows from the proposed site to the existing runoff rate of 4 l/s.

2.8 Drainage at the ground floor and above will drain via gravity. Flows will be attenuated in geo-cellular crates with a volume of approximately 17m^3 located in the front garden of the development. Flows will be restricted using an onsite flow control to control discharge to the existing combined sewer network in Goldhurst Terrace.

2.9 Linear channels will be installed along the eastern perimeter of the terraced areas in the back-gardens. These channels will drain to a sump which will discharge to the new on-site surface water network and geo-cellular attenuation crates. The basement garden areas will each contain trapped gullies which will connect to the basement surface water drainage, which in turn will be pumped to the suspended drainage network at the ground floor.

2.10 Furthermore, sections of green roof (38m^2) will be installed as part of the drainage strategy, assisting in the reduction of surface water runoff rates and volumes from site.

2.11 Full drainage calculations will be completed at detailed design stage, however, the system will ensure that the peak rate of runoff does not increase following development and the development will therefore not increase flood risk elsewhere.

2.12 As per the CP4 Basements and Lightwells development document requirements a positively pumped device will be installed to protect the subterranean development from sewer flooding. A separate surface water positively pumped device will also be installed in the basement.

[10] The screening flow chart in CP4 references that the principles outlined in PPS25 should be followed to ensure that flood risk is not increased. This document has since been superseded by "Flood Risk and Coastal Change" Guidance, which should now be referred to alongside the NPPF, to ensure that flood risk is not increased.

2.13 A SuDS technical note has been produced by Elliott Wood. This note provides detail regarding the maintenance strategy for the proposed SuDS. The document reference is 2150657 Goldhurst Terrace.

3.0 Potential Flooding on Site

Historic Information

3.1 The LBC SFRA states that the Environment Agency's Historic Flood Map shows that flooding from fluvial or tidal sources within LBC has not occurred.

3.2 Appendix 4 of the "Floods in Camden – Report of the floods Scrutiny Panel"[11] document states that Goldhurst Terrace was affected by surface water flooding during both the 1975 and the 2002 events. "Map 6: Historic Flooding and Local Flood Risk Zones" of the Camden Local Plan[12] illustrates the extent of both flooding events. In both instances, the floods that occurred are understood to have been the result of high intensity rainfall inundating the main sewer and causing manholes and gullies to surcharge.

3.3 Figure 3v of the LBC SFRA, indicates that Goldhurst Terrace was affected by surface water flooding in 2002 and that 2 no. properties were affected along the street. Figure 15 of the ARUP study show that Goldhurst Terrace has been recorded to have flooded in 2002.

3.4 Appendix B: Figure 5a of the LBC SFRA shows that Goldhurst Terrace is located within NW6 3, which is an area identified by Thames Water as containing 8 properties that have been affected by internal sewer flooding within the 10 years prior to 2014. Figure 5b indicates that Goldhurst Terrace is located within an area identified by Thames Water as containing 18 properties that were affected by external flooding within the 10 years prior to 2014.

3.5 Figure 4a of the LBC SFRA indicates an "Environment Agency groundwater flood incident" approximately 300m north of the site.

3.6 The Sewer Flooding History Enquiry made to Thames Water indicates that Thames water holds records of incidents of flooding as a result of surcharging public sewers in the area of the proposed development, see Appendices.

Tidal and Fluvial Flooding

3.7 Figure 2 below shows the Environmental Agency "Flood Map for Planning".

[11] Floods in Camden – Report of the floods Scrutiny Panel, June 2003

[12] Camden Local Plan, Draft 2016

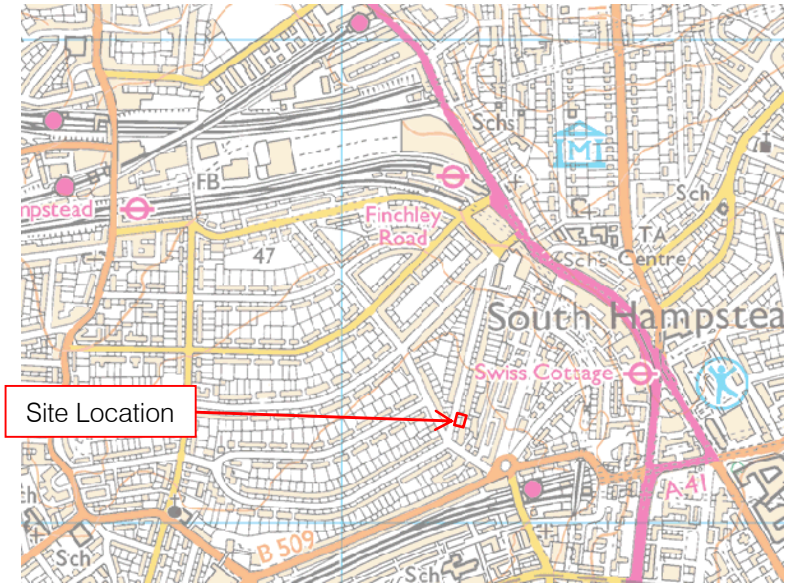


Figure 2 – Environment Agency Flood Zone Maps[13]

3.8 The site is located in Flood Zone 1 and is approximately 5.8km northwest of the River Thames at its nearest location. As stated in the NPPF, "*this zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial and tidal flooding (<0.1%)".* Therefore the risk of flooding from tidal and fluvial sources is considered low.

Flooding from Sewers and Overland Flow

3.9 Surface water flooding is typically the result of high intensity rainfall that is unable to infiltrate into the ground or enter the drainage system, ultimately following overland flow paths. In an urban environment such as Camden, surface water runoff is disposed of almost entirely via formal drainage systems, and consequently sewer flooding and surface water flooding (overland flow) need to be considered in tandem in this instance.

3.10 It is reasonable to assume that adopted sewers have been designed to the 1 in 30 year return period (in accordance with Sewers for Adoption[14]), which is considerably lower than the 100 year standard considered for fluvial flooding. As such, sewer flooding is often more frequent but less severe than fluvial flooding.

3.11 The North London SFRA collected data from flooding events in 1975 and 2002 which have been used by Camden to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement developments[15]. In this document, roads having flooded in 1975 and 2002 are known as "primary areas" and those that flooded in only the 1975 or 2002 are known as 'secondary areas'. Any proposals for a basement development located in a primary or secondary area must include a flood risk assessment.

3.12 The site is located in a "primary area" and therefore this surface water and flood risk assessment has been prepared to assess all the risks. The LBC experienced flooding in 1975 and 2002, which was attributed to overland flow and sewer flooding. Goldhurst Terrace is recorded as having flooded during both events, however the records are not detailed and entire roads have been highlighted without reference to specific

[13] © Environment Agency copyright and database rights 2016. © Ordnance Survey Crown copyright. All rights reserved. Environment Agency, 100026380. Contains Royal Mail data © Royal Mail copyright and database right 2016.

[14] WRc7 plc (August 2012) Sewers for Adoption – A Design and Construction Guide for Developers. 7th Edition.

[15] London Borough of Camden, Shaping Camden – Guidelines – New Basement Development and Extensions to Existing Basement Accommodation, February 2009

locations or to which properties were flooded on these roads. Figure 3v in the LBC SFRA indicates that two properties were flooded on Goldhurst Terrace.

3.13 The Environment Agency "updated Flood Map for Surface Water" (uFMfSW), shown in Figure 3 below, indicates the "medium" chance of occurring, which is the design case. The map indicates that the site is not at risk from surface water flooding.

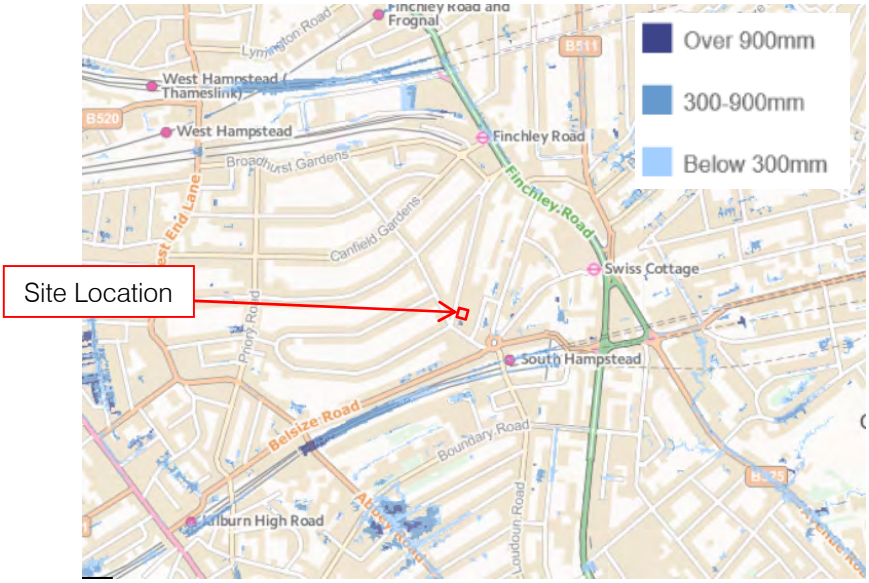


Figure 3 - Environment Agency uFMfSW "Medium chance"

3.14 The Thames Water asset plan combined with the "G.O. Drainage Services Ltd. CV.0982 115-119 Goldhurst Terrace NW6" survey report confirms that the site is connected to the combined public sewer located in Goldhurst Terrace. The Thames Water asset plan indicates that the road falls from 39.6m northeast of the site to 38.25m southwest of the site.

3.15 The Goldhurst Terrace carriageway falls significantly northeast of the site and continues to fall more moderately as it continues southwest, see Photographs 2 and 3 in the Appendix. The topographic survey of the site indicates that the top of kerb levels (38.49m to 38.47m) are lower than the levels at the existing entrance to the site (38.61m to 38.63m), equating to a raised threshold of between 120mm to 160mm. The new entrance to the site is located slightly further north. The existing level of the paving at this location is approximately 38.57mAOD, with the existing level in the front garden being approximately 38.64mAOD. To maintain the current "low" risk from flooding of sewers and overland flow, it is recommended that a raised threshold of minimum 150mm as per the CIRIA[16] guide (C523) recommendations, is applied at the new entrance to the garden.

Flooding from Groundwater

3.16 The online 1:50,000 BGS map indicates the site to be underlain by the London Clay formation. No superficial deposits were recorded at the site.

3.17 A site investigation[17] was undertaken in May 2016. No groundwater was encountered as part of the initial investigations. However, groundwater was encountered in the ground water monitoring piezometers of both "continuous flight auger boreholes", WS1 and WS2 at 1.04m and 1.05m bgl respectively, after a period of approximately 6 weeks. The borehole carried out, Borehole 1, encountered made ground and then clay to

[16] CIRIA C523 – Sustainable Urban Drainage Systems – Best Practice Manual

[17] Site Analytical Services Ltd, Basement Impact Assessment, Ref No. 16/24927-, May 2016

the full depth of investigation (20m). This conforms to the information shown on the BGS map and also to Figure 4b in the LBC SFRA.

3.18 Figure 4a from the LBC SFRA indicates a historic groundwater flood incident, obtained from Environment Agency records, approximately 300m north of the site.

3.19 Due to the groundwater being encountered at shallow depth during the ground investigation it is suggested that appropriate dewatering methods may be required during excavation. Furthermore, the basement should be designed to prevent water ingress using the drained cavity system, and therefore there should be no significant risk of flooding to the basement.

3.20 The proposed developed site and surrounding area is largely hard paved, which reduces the emergence of groundwater at the surface. Groundwater emergence at the site or elsewhere in the area would follow localised flow paths, therefore, any flooding should mimic that indicated on the surface water flood risk map and discharge to the local sewer system.

3.21 Provided that the proposed mitigation is implemented, the site is not at risk of flooding from groundwater.

Flooding from Reservoirs, Canals and Other Artificial Sources

3.22 The Environment Agency "Risk of Flooding from Reservoirs" map indicates that the site is not located within an area that is at risk.

3.23 Figure 11 "Camden, Geological, Hydrogeological and Hydrological Study – Watercourses" of the ARUP[18] study shows that a tributary of the lost Westbourne River is located approximately 200m northwest of the site. The study states that the river is, through the use of manmade culverts, artificially channelled and discharges into the local storm drainage.

3.24 Figure 14 of the ARUP study[18] shows the Hampstead Heath Surface Water Catchments and Drainage including the pond chains, in greater detail. The site is not located within the catchment of the pond chains on Hampstead Heath.

3.25 The risk of flooding from artificial water bodies is therefore considered unlikely.

[18] ARUP Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development, November 2010

4.0 Conclusions and Recommendations

4.1 The site is located at 115-119 Goldhurst Terrace in LBC. The existing site consists of a block of residential accommodation and associated permeable and impermeable garden area. Proposals are for the demolition of the existing building and construction of a new larger building and a new basement under the entire new building footprint. This will require excavation in the rear garden for the construction of the new building, the new basement walls and the associated lightwells. It will also require excavation in the existing front garden for excavation of the new basement walls and the associated lightwells. The new building will house a number of individual apartments with a common entrance hallway.

4.2 The Environment Agency flood zone maps indicate that the site is located in Flood Zone 1 (Low Risk). In accordance with the Flood Risk and Coastal Change Guidance to the National Planning Policy Framework (NPPF), this zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding (<0.1%). Local planning guidance on basement developments specifies that all new basement developments located in borough-defined areas at risk of surface water and surface flooding need to be accompanied by a Flood Risk Assessment.

4.3 The North London SFRA has collected data from flooding events in 1975 and 2002 which have been used by Camden to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement developments. Any proposals for a basement development located in a primary or secondary area must include a FRA.

4.4 The site is located in a "primary area" and therefore this surface water and flood risk assessment has been prepared to assess all the risks. LBC experienced flooding in 1975 and 2002, which was attributed to overland flow and sewer flooding. Goldhurst Terrace is recorded as having flooded during both events, however the records are not detailed and entire roads have been highlighted without reference to specific locations or to which properties were flooded on these roads.

4.5 In addition to the above requirement for a Flood Risk Assessment, the LBC SFRA identified the site as being within a "Local Flood Risk Zone" (LFRZ). The Council requires that a FRA is carried out for any site located within an LFRZ

4.6 All sources of flooding have been assessed in accordance with the NPPF and are considered to pose a low risk to the site. Goldhurst Terrace flooded in 1975 and 2002, however, the site itself is raised above the adjacent road level of Goldhurst Terrace. It is recommended that a raised threshold of minimum 150mm, as per CIRIA guide C523, be applied to the proposed new entrance to match the existing raised entrance to maintain the current higher level above the road level and maintain the risk at "low".

4.7 The proposed basement is at low risk of flooding from all sources and is considered acceptable in the context of flood risk. Furthermore, surface water runoff from the site will not increase following development due to the implementation of SuDS on site with attenuation proposed in the front garden area, thus there will be no increase in flood risk elsewhere in the borough as a result of the development.

Appendix A

Drawing 1- Surface Flow and Flooding Screening Flowchart

ARUP, Job No. 213923/KM
This flowchart is a guidance tool from the Camden geological, hydrogeological and hydrological study on subterranean development on how to complete a surface flow and flooding assessment.

Drawing 2- Topographic Survey

Drawing Number 94605.0001
This drawing shows a topographic survey of the existing site with all levels related to GPS.

Drawing 3 - Asset Location Map

Thames Water, Ref No. 212099
This map shows the Thames Water asset locations near the site.

Drawing 4 - Proposed Below Ground Drainage Strategy Ground Floor

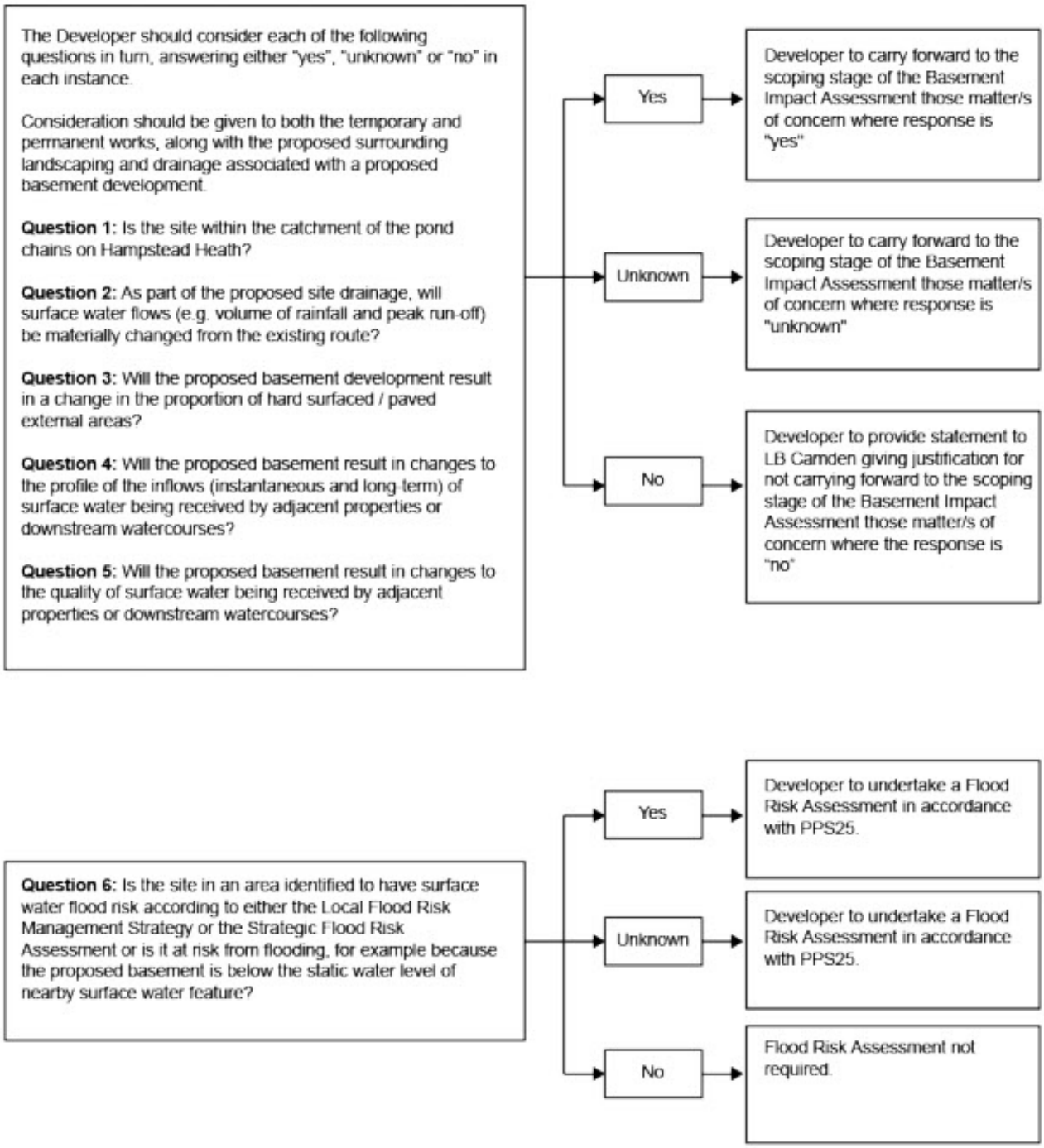
Elliot Wood Job No. 2150657, Drawing No. D15001, Rev P1
This sketch gives details of the proposed below ground drainage strategy for the ground floor.

Drawing 5 - Proposed Below Ground Drainage Strategy Basement

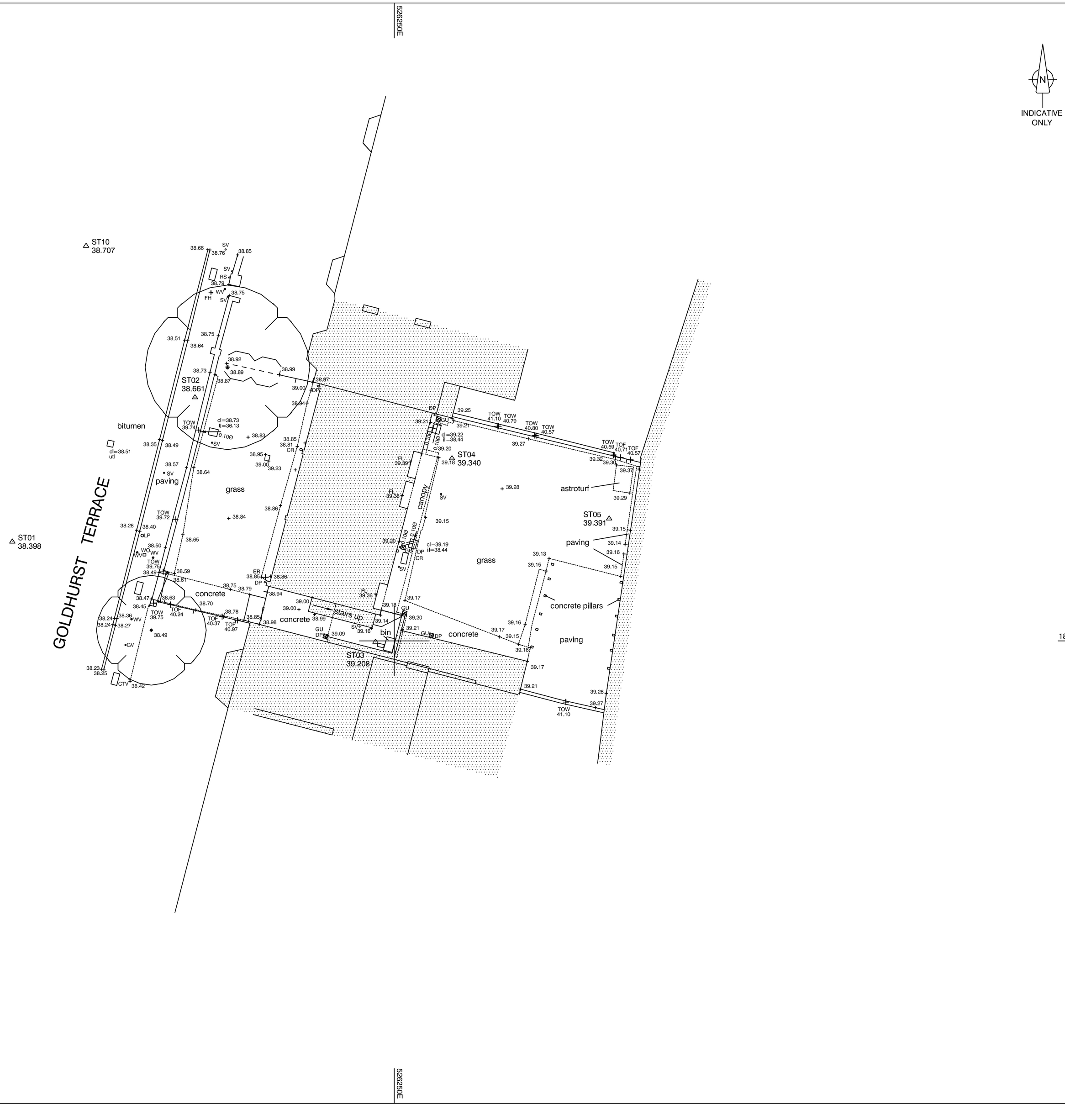
Elliot Wood Job No. 2150657, Drawing No. D15000, Rev P1
This sketch gives details of the proposed below ground drainage strategy for the basement.

Thames Water Flood Sewer History Enquiry

Contains information on the history of flooding from Thames Water sewers in the area local to the site.


The Developer should consider each of the following questions in turn, answering either "yes", "unknown" or "no" in each instance.
Consideration should be given to both the temporary and permanent works, along with the proposed surrounding landscaping and drainage associated with a proposed basement development.
Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?
Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?
Question 3: Will the proposed basement developrnent result in a change in the proportion of hard surfaced / paved external areas?
Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?
Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?
Yes
Developer to carry forward to the scoping stage of the Basement Impact Assessment those matter/s of concern where response is "yes"
Unknown
Developer to carry forward to the scoping stage of the Basement Impact Assessment those matter/s of concern where response is "unknown"
No
Developer to provide statement to LB Camden giving justification for not carrying forward to the scoping stage of the Basement Impact Assessment those matter/s of concern where the response is "no"

Question 6: Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?
Yes
Developer to undertake a Flood Risk Assessment in accordance with PPS25.
Unknown
Developer to undertake a Flood Risk Assessment in accordance with PPS25.
No
Flood Risk Assessment not required.



Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
- OTHER FENCE
- KERB
- DROPPED KERB
- GULLY CHANNEL
- TOP / BOTTOM OF BANK
- FOLIAGE
- DITCH
- VERGE
- OVERHEAD CABLES
- GATE
- HEDGE
- TREE - BROAD LEAVED
- TREE - CONIFEROUS
- BUSH
- BUILDING
- BOREHOLE
- SURVEY STATION
- ORDNANCE SURVEY BENCH MARK

A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	RODDING POINT
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FH	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if free species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

Notes.

Coordinates related to OS National Grid from ST01 by GPS (No scale factor added).
Levels related to GPS.

Rev	Details of Revision	Drawn	Date
A	Building amended	GD	04/12/15

Surveyed	Drawn	Date	Checked	Date	Approved	Date
GD	KM	30/10/15	SE	06/11/15	RGT	06/11/15

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Client.

SEQOYA
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Title.

TOPOGRAPHICAL SURVEY

MARYON HOUSE
115-119 GOLDHURST TERRACE
LONDON
NW6 3EY

Dwg No. **150683** Sheet **1 of 1**

Scale 1:200 A2 Sheet Rev. A

Asset Location Search Sewer Map - ALS/ALS Standard/2016_3244003

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526234,184214

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.

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
1010	0	0
1001	n/a	n/a
1011	n/a	n/a
1012	n/a	n/a
1013	n/a	n/a
1014	n/a	n/a
1015	n/a	n/a
1016	n/a	n/a
1017	n/a	n/a
0983	n/a	n/a
1403	n/a	n/a
1404	n/a	n/a
1405	n/a	n/a
1406	n/a	n/a
1407	n/a	n/a
1408	n/a	n/a
1409	n/a	n/a
1410	n/a	n/a
1411	n/a	n/a
1412	n/a	n/a
14DG	n/a	n/a
2409	n/a	n/a
24DD	n/a	n/a
2406	n/a	n/a
341E	n/a	n/a
341B	n/a	n/a
341A	n/a	n/a
4401A	n/a	n/a
42BD	n/a	n/a
42BC	n/a	n/a
42DA	n/a	n/a
42BF	n/a	n/a
42BB	n/a	n/a
42BG	n/a	n/a
42CA	n/a	n/a
42AE	n/a	n/a
42BJ	n/a	n/a
42BI	n/a	n/a
42AF	n/a	n/a
43AE	n/a	n/a
43AD	n/a	n/a
42AG	n/a	n/a
42BA	n/a	n/a
43AC	n/a	n/a
42AJ	n/a	n/a
42AI	n/a	n/a
32EB	n/a	n/a
32EA	n/a	n/a
42IC	n/a	n/a
43BI	n/a	n/a
43BJ	n/a	n/a
43BH	n/a	n/a
43BG	n/a	n/a
42IB	n/a	n/a
43BF	n/a	n/a
43BE	n/a	n/a
42IA	n/a	n/a
43BD	n/a	n/a
42FI	n/a	n/a
42HJ	n/a	n/a
43BC	n/a	n/a
43BB	n/a	n/a
43BA	n/a	n/a
42CE	n/a	n/a
43AJ	n/a	n/a
42CD	n/a	n/a
43AI	n/a	n/a
42CC	n/a	n/a
43AH	n/a	n/a
42BE	n/a	n/a
42CB	n/a	n/a
42CI	n/a	n/a
42CJ	n/a	n/a
32CH	n/a	n/a
32BG	n/a	n/a
32CI	n/a	n/a
32BF	n/a	n/a
32DA	n/a	n/a
32CJ	n/a	n/a
32DB	n/a	n/a
32DC	n/a	n/a
33AF	n/a	n/a
33BB	n/a	n/a
3203	n/a	n/a
33AG	n/a	n/a
33AJ	n/a	n/a
3301	41.51	39.42
33AI	n/a	n/a
33BF	n/a	n/a
33AH	n/a	n/a
32FB	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
32FA	n/a	n/a
32ED	n/a	n/a
32EJ	n/a	n/a
341D	n/a	n/a
32DH	n/a	n/a
32DG	n/a	n/a
32DJ	n/a	n/a
32EC	n/a	n/a
341C	n/a	n/a
22CA	n/a	n/a
22CB	n/a	n/a
22CC	n/a	n/a
22CD	n/a	n/a
3109	n/a	n/a
22CE	n/a	n/a
321A	n/a	n/a
32DD	n/a	n/a
3201	n/a	n/a
31DA	n/a	n/a
32GF	n/a	n/a
32GE	n/a	n/a
32GD	n/a	n/a
32GC	n/a	n/a
32EI	n/a	n/a
32FD	n/a	n/a
32FC	n/a	n/a
32EH	n/a	n/a
32EG	n/a	n/a
32EF	n/a	n/a
32EE	n/a	n/a
32AG	n/a	n/a
42FJ	n/a	n/a
42GB	n/a	n/a
42GC	n/a	n/a
42GD	n/a	n/a
42GE	n/a	n/a
42GF	n/a	n/a
41AG	n/a	n/a
41AH	n/a	n/a
42GJ	n/a	n/a
42HD	n/a	n/a
42HC	n/a	n/a
42HB	n/a	n/a
42FA	n/a	n/a
42EJ	n/a	n/a
42HH	n/a	n/a
42EG	n/a	n/a
42EI	n/a	n/a
42HG	n/a	n/a
42CG	n/a	n/a
4201	42.62	39.96
42CF	n/a	n/a
1303	41.29	36.03
1101	37.5	28.05
1106	37.52	32.57
1103	37.52	n/a
121A	n/a	n/a
1203	n/a	n/a
1102	37.68	n/a
2105	38.25	n/a
2002	36.69	35.48
2070	n/a	n/a
2203	n/a	n/a
2071	n/a	n/a
2204	n/a	n/a
211A	n/a	n/a
2101	37.29	36.23
21DG	n/a	n/a
221A	n/a	n/a
221B	n/a	n/a
2001	37.43	33.06
2072	n/a	n/a
2103	38.04	n/a
21DF	n/a	n/a
21DH	n/a	n/a
2302	n/a	n/a
2102	38.22	34.86
2073	n/a	n/a
2104	38.31	35.39
4001	42.6	36.42
4002	44.72	39.77
4101	41.59	35.25
3002B	n/a	n/a
3101	39.22	37.69
3102	39.39	34.97
3103	39.44	35.71
3104	40.01	35.09
3108	n/a	n/a
4105	n/a	n/a
4106	n/a	n/a
3105	39.68	35.93
3106	n/a	n/a
4107	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
31DF	n/a	n/a
31DE	n/a	n/a
311B	n/a	n/a
211B	n/a	n/a
31DD	n/a	n/a
311A	n/a	n/a
31BE	n/a	n/a
41BG	n/a	n/a
31DC	n/a	n/a
41BF	n/a	n/a
31DB	n/a	n/a
41AJ	n/a	n/a
3107	40.91	38.37
41AI	n/a	n/a
0402	42.79	n/a
9302	42.9	n/a
0102	n/a	n/a
041A	n/a	n/a
011A	n/a	n/a
0201	41.49	37.06
0003	n/a	n/a
0101	39.58	35.4

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

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

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

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.

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate 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 level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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 present on the plan, please contact a member of Property Insight on 0845 070 9148.

N

SURFACE WATER DRAIN TO RUN @ HIGH LEVEL BASEMENT. DETAILS TBC BY M+E ENGINEER.

RWP

SW7

FW6

SW6

RWP

S4

TG

CONNECTIONS FROM HIGH LEVEL FOUL NETWORK. DETAILS OF SUSPENDED NETWORK TBC BY THE M+E ENGINEER.

LINEAR CHANNEL WITH SUMP UNIT AND FOUL AIR TRAP.

CONNECTS TO COMBINED WATER SEWER IN GOLDHURST TERRACE.

TG

UNIT 4
3 BED
1243 ft²

FALL

Ex. 150ϕ CW

BD

BD

FW5

VORTEX FLOW CONTROL DEVICE INSTALLED IN MANHOLE SW8. TO RESTRICT SURFACE WATER RUN OFF TO 4L/S.

SW8

EXISTING MANHOLE TO BE RETAINED.
CL 38.73
IL 36.01

NOTE: DRAINAGE AT GROUND FLOOR AND ABOVE IS TO DRAIN VIA GRAVITY @ HIGH LEVEL BASEMENT. DETAILS TBC BY THE MHE ENGINEER.

GEOCELLULAR ATTENUATION CRATES. VOLUME = 17m³. DETAILS TBC.

FW4

UNIT 5
3 BED
1391 ft²

RWP

CONNECTIONS FROM HIGH LEVEL FOUL NETWORK. DETAILS OF SUSPEND NETWORK TBC BY THE MHE ENGINEER.

LINEAR CHANNEL WITH SUMP UNIT AND FOUL AIR TRAP.

TG

FW3

FALL

SW5

SW4

SW3

S4

RWP

RWP

SURFACE WATER DRAIN TO RUN @ HIGH LEVEL BASEMENT. DETAILS TBC BY MHE ENGINEER.

NOTES

1. ALL GROUND FLOOR DRAINAGE AND ABOVE IS TO DRAIN VIA GRAVITY @ HIGH LEVEL BASEMENT. DETAILS OF SUSPENDED DRAINAGE NETWORK TBC BY THE MHE ENGINEER.

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

. Do not scale from this drawing.

LEGEND

- PROPOSED FOUL WATER
- PROPOSED FOUL WATER MANHOLE
- PROPOSED SURFACE WATER
- PROPOSED SURFACE WATER MANHOLE
- EXISTING COMBINED WATER
- EXISTING COMBINED WATER MANHOLE
- PROPOSED LINEAR CHANNEL.

rev	date	by	chk	description
P1	06.06.16	KTR	PC	PRELIMINARY ISSUE

drawing title
PROPOSED BELOW GROUND DRAINAGE STRATEGY GROUND FLOOR

scale(s)	date	drawn
1:100@A3	06.06.16	KTR

drawing status
PRELIMINARY

elliottwood
Elliott Wood Partnership Ltd
Wimbledon • Central London • Nottingham
Consulting Structural and Civil Engineers
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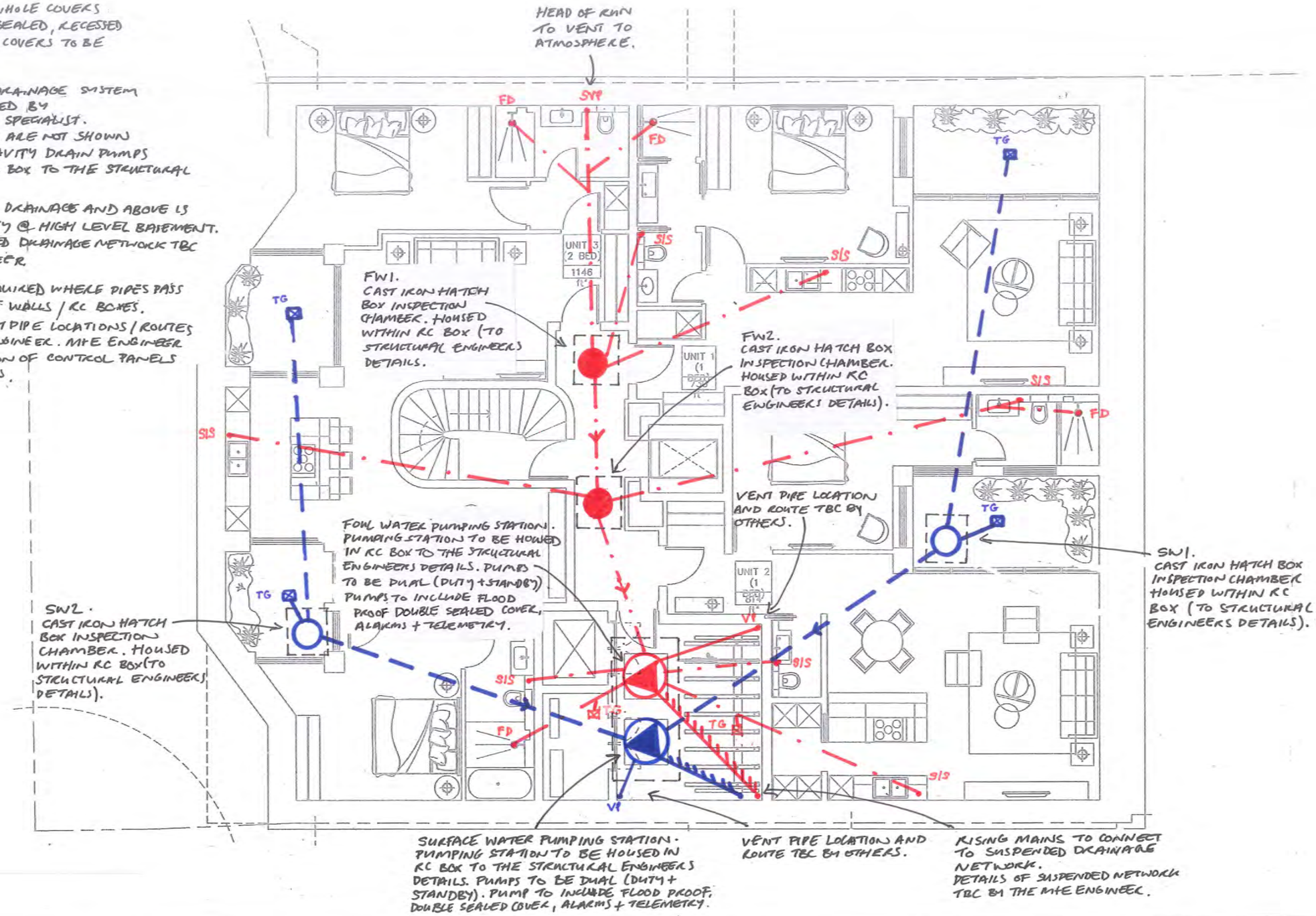
job title
115-119 GOLDHURST TERRACE, LONDON, NW6 3HR

job no	drawing no	revision
2150657	D/5001	P1

NOTES

1. ALL INTERNAL MANHOLE COVERS ARE TO BE DOUBLE SEALED, RECESSED AND LOCKABLE. ALL COVERS TO BE LOAD CLASS B125.
2. DETAILS OF CAVITY DRAINAGE SYSTEM ARE TO BE CONFIRMED BY THE WATERPROOFING SPECIALIST. CAVITY DRAIN PUMPS ARE NOT SHOWN ON THIS DRAWING. CAVITY DRAIN PUMPS TO BE HOUSED IN RC BOX TO THE STRUCTURAL ENGINEERS DETAILS.
3. ALL GROUND FLOOR DRAINAGE AND ABOVE IS TO DRAIN VIA GRAVITY @ HIGH LEVEL BASEMENT. DETAILS OF SUSPENDED DRAINAGE NETWORK TBC BY THE M+E ENGINEER.
4. PUDDLE FLANGES REQUIRED WHERE PIPES PASS THROUGH BASEMENT WALLS / RC BOXES.
5. RISING MAIN + VENT PIPE LOCATIONS / ROUTES TBC BY THE M+E ENGINEER. M+E ENGINEER TO CONFIRM POSITION OF CONTROL PANELS FOR PUMPING STATIONS.



This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

LEGEND CONT.

- FOUL PUMPING STATION
- SURFACE WATER PUMPING STATION
- RISING MAINS

LEGEND

- PROPOSED FOUL WATER
- PROPOSED FOUL WATER MANHOLE
- PROPOSED SURFACE WATER
- PROPOSED SURFACE WATER MANHOLE
- SVP SOIL VENT PIPE
- FD FLOOR DRAIN (SPEC TBC BY ARCHITECT)
- SLS STUB STACK
- TG TRAPPED GULLY
- TG PLANT ROOM GULLY

rev	date	by	chk	description
P1	06.06.16	KT	PC	PRELIMINARY ISSUE

drawing title
PROPOSED BELOW GROUND DRAINAGE STRATEGY BASEMENT

scale(s) 1:100@A3 | date 06.06.16 | drawn KTR

drawing status
PRELIMINARY

elliottwood
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Wimbledon • Central London • Nottingham
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tel. (020) 7499 5888 www.elliottwood.co.uk

job title
115-119 GOLDHURST TERRACE LONDON, NW6 3HR.

job no	drawing no	revision
2150657	D15000	P1

Sewer Flooding

History Enquiry

Search address supplied: 113,Goldhurst Terrace,London,NW6 3HA

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

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Slough SL1 4WW

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I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Sewer Flooding
History Enquiry

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 incidents of flooding as a result of surcharging of public sewers in the area. Although Thames Water may have records of sewer flooding within the area, the details of the effect of this flooding on individual properties should be obtained from the current owners. This should include flooding from water courses and highway drains, neither, of which are the responsibility of Thames Water.

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

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Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Appendix B

Photograph 1 - Existing building showing raised ground floor balconies and raised entrance to the front garden

Photograph 2 - Goldhurst Terrace, facing northeast

Photograph 3 - Goldhurst Terrace, facing southwest