SEVENOAKS, 101 A HIGH STREET, HAMPTON
Flood Risk Assessment, Drainage Strategy and Basement Impact Assessment

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Revision	Amendment Details	Revision Prepared By	Revision Approved By
Rev A	Updated Plans	TT	CEB
Rev B	Ground Investigated and assessment	AW	CB/CEB

EXECUTIVE SUMMARY

The site assessed in this report is the property known as Sevenoaks, located at 101 A High Street, Hampton TW12 2SX, within the London Borough of Richmond upon Thames (LBR).

The proposals at the site are for the demolition of the existing building which will be replaced by the construction of a replacement dwelling with five bedrooms, which will include a basement and sunken courtyards. In addition, a deep-water feature, and terrace are proposed.

The proposed finished basement floor levels (FFL) will extend downwards 3.0 m below the proposed ground floor level to approximately 9.60m AOD.

This report includes responses to the Screening Questions within the London Borough of Richmond Basement Assessment User Guide. To complete these questions a Flood Risk Assessment (FRA) and ground movement assessment were required to be undertaken including an assessment of geology and hydrogeology. This was to ensure the "Subterranean Characteristics", “Land Stability” and "Flood Risk and Drainage" questions could be answered accurately.

The FRA, land stability and the Screening Questions highlighted the following potential risks: A risk of flooding from surface water; the site being located on permeable geology; the likely presence of perched water and the proposed increase in impermeable surfaces post development altering surface water runoff rates. As such, this resulted in further assessment in the form of a Flood Risk Assessment (FRA) and Sustainable surface water Drainage Strategy (SuDS) were undertaken to inform the Basement Impact Assessment (BIA). There is a risk the proposed basement could impact upon adjacent properties. Therefore, a ground movement assessment was undertaken. The proposal to remove 3No. trees as part of the development could result in shrinking and swelling of the underlying strata. Therefore, a site specific arboricultural assessment was undertaken.

The FRA concluded that the Site is located within Flood Zone 1 of the River Thames and Longford River. The FRA has also demonstrated that although there are areas of minor surface water ponding predicted on the site, the development area itself is not at risk of surface water flooding. It has been recommended that the finished floor level and threshold levels be set 75-150 mm above surrounding ground levels in accordance with CIRIA Designing for Urban Exceedance. This is to prevent the ingress of any unforeseen surface water flooding.

The site is located on Kempton Park Gravel Member, which is underlain by clay (London Clay) which commences at 5.00 m bgl, as confirmed by an onsite investigation by Create Consulting Engineers in September 2024. The two on-site boreholes were drilled to depths of 6 m (BH01) and 10 m (BH02) below ground level (bgl); both of which are below the depth of the proposed basement extension.

Water was noted in the logs between 2.00 and 4.00 m bgl within the sand and gravel layers. The clay layers were noted as dry. This indicate the water recorded is a perched water table, which can’t

infiltrate past the impermeable London Clay strata. Likewise, water can't rise through the clay formation. This means the true water table, would be located below the impermeable clay strata.

Reviewing historical weather and rainfall totals proceeding the site investigation, rainfall was deemed average or above average for that time of year by published sources. As a perched water table was discovered, it can be expected that the proposed basement extension will interact with the perched water. It should be noted that the current house foundation most likely also interacts with the perched water due to its proximity to ground level. The creation of a new dwelling with below ground elements would not drastically alter the situation and interaction with the perched water table.

Based on the proposed development and Site geology, the ground movement assessment calculates a negligible damage impact on proximal properties from basement construction. Additionally, the removal of the three low water demand trees will not result in ground instability.

An outline SuDS strategy has been included within this report and detailed runoff calculations have been undertaken for the site in its existing and proposed state. Runoff will be limited to 1 l/s, in accordance with the SuDS Hierarchy and to provide multiple benefits, a green roof and an attenuation tank have been proposed to provide storage prior to discharge. This ensures that there is a reduction in runoff from the site compared to the existing development which had an uncontrolled outfall. This reduces the risk of flooding to others.

This BIA covers flood risk, land stability and SuDS. The development with mitigation measures outlined in this report is at low risk of flooding and the inclusion of SuDS ensures there is a reduction in surface water flow rates post development.

ABBREVIATIONS

Acronym	Definition
AOD	Above Ordnance Datum
BIA	Basement Impact Assessment
BGL	Below Ground Level
BGS	British Geological Survey
DEFRA	Department for Environment Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environnent Agency
FEH	Flood Estimation Handbook
FFL	Finished Floor Level
FRA	Flood Risk Assessment
LBR	London Borough of Richmond upon Thames
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RPZ	Root Protection Zone(s)
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SSSI	Site Specific Scientific Interest

1.0 INTRODUCTION

1.1 The information contained in this report is based on a review of existing information and consultation with interested parties.

General Information

1.2 This site is located at the property known as Sevenoaks, 101 A High Street, Hampton, TW12 2SX, and lies within the jurisdiction of the London Borough of Richmond (LBR). The site is less than 1 ha in size and is currently occupied by an existing residential dwelling.

1.3 The proposals at the site are for the demolition of the existing dwelling, which will be replaced by the construction of a new five-bedroom single family dwelling with an associated basement structure.

1.4 This report has been prepared to complete the LBR Basement Screening Questions for the "Subterranean Characteristics" and "Flood Risk and Drainage" sections. From these questions, a Flood Risk Assessment (FRA) and an outline a strategy for Sustainable Drainage Systems (SuDS) were triggered and are included in this report. Both of these reports are required for the proposed development separate from the BIA.

1.5 The proposed development at Sevenoaks, 101A High Street, will now herein be referred to as 'the Site'.

Scope of Study

1.6 The approach follows the procedure adopted by the LBR for the assessment of basements. This report covers the 'Subterranean Characteristics', 'Land Stability' and 'Flood Risk and Drainage' elements of the basement screening assessment. This report is divided into four stages: Desk Study; Screening; Scoping; and Impact Assessment. The structure of this assessment is guided by the LBR Basement Assessment User Guide[1].

1.7 The study includes a Flood Risk Assessment (FRA), ground movement assessment and Sustainable Drainage Systems (SuDS) Assessment as part of the report. The scope of the FRA, ground movement assessment and SuDS Assessment is as follows:

- To provide a flood risk assessment of the site, compliant with the guidelines set out in the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG).
- To assess the risk and implications of flooding on the site including flooding from tidal, fluvial, groundwater, surface water runoff, and artificial sources.

[1] London Borough of Richmond, Basement Assessment User Guide, 2021

- To provide advice on the site layout and design that will ensure the safe operation of the site in any flood event.
- To give consideration of the pre- and post-development drainage systems and calculation of pre- and post-development runoff rates and volumes based on standard methodologies.
- To provide advice and guidance on the management of surface water runoff at the site to ensure the risk of surface water flooding on the site and on nearby sites does not increase post-development.
- Assess the damage risk to adjacent properties from basement construction and tree removal.

2.0 SITE DESCRIPTION

Location

2.1 The site is situated at Sevenoaks, 101 A High Street, in Hampton TW12 2SX, this can be seen in Figure 2.1 below. High Street is situated to the north of Upper Sunbury Road / A308.

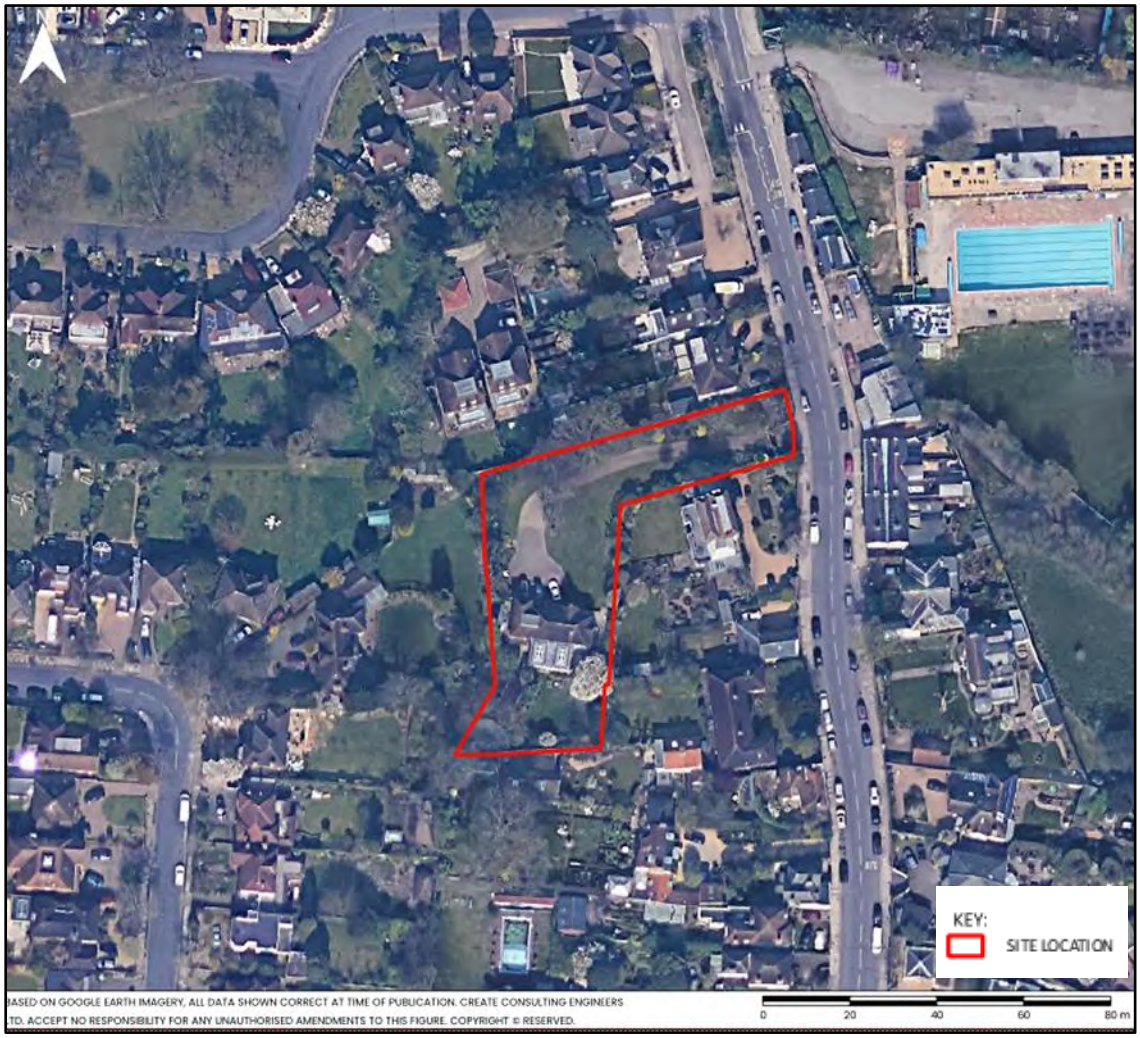


Figure 2.1 Site Location Plan

2.2 The site is bounded by neighbouring residential dwellings. The River Thames is located to the south of the site, approximately 560 m away. Longford River is a smaller tributary of the River Thames, located approximately 430 m to the east of the site.

2.3 The site is located within the jurisdiction of the LBR which fulfils the roles of the Local Planning Authority (LPA) and Lead Local Flood Authority (LLFA).

Existing Development

2.4 The property at the site is used as a single-family residential dwelling with associated garden outbuildings.

2.5 There is no basement level associated with the existing property.

2.6 The main entrance to the property is from High Street via a double gate and driveway between neighbouring houses.

2.7 Drawings detailing the current property layout are shown attached to this report.

Topographic Survey

2.8 A topographic survey has been carried out across the site by Total Geomatics in June 2024. The survey has been completed at Ordnance Datum Newlyn.

2.9 The survey shows that ground levels are predominantly flat across the site, ranging from 12.65 m AOD to the site entrance and southern boundaries to 12.5 m AOD in the centre of the site.

2.10 Existing ground floor finished floor levels (FFL) are raised above the surrounding external ground level, except the room which has the French doors (at the rear of the property) which are 5 mm lower than the surrounding ground levels.

Proposed Development

2.11 The proposed development plans to replace the existing dwelling in its entirety with a new single occupancy, five bed family home. A basement is proposed as part of the replacement house which contains a tv room, gym, office, studio, store, and plant room and will have level access out to sunken garden areas. A deep-water feature and terrace are also proposed as part of the proposed development.

2.12 The proposed building footprint is approximately 519 m^2. The proposed basement footprint has an area of around 191 m^2. The proposed sunken courtyards have an approximate area of 52 m^2. The total below ground area is 191 m^2.

2.13 The proposed water feature on the site is to be around 1.2 m deep.

2.14 The proposed basement will have internal access through the ground floor of the proposed new dwelling. External access to the basement will be possible through the sunken courtyard.

2.15 The FFL of the basement will be 3.00 m below the existing ground level of the northern garden. This would place the basement FFL at approximately 9.60 m AOD. The base of the basement will be lower than this due to the foundations.

2.16 The layouts of the proposed site are attached to this report.

2.17 The proposed development increases the overall footprint of the existing property by approximately 442 m^2. As such there will be an increase in the percentage of hard standing area on the site post-development. A sustainable drainage (SuDS) assessment will therefore need to be undertaken to ensure the development can be adequately drained without exacerbating flooding elsewhere.

3.0 BASEMENT SCREENING ASSESSMENT

3.1 According to the LBR Basement Assessment User Guide, any proposed development which includes a subsurface structure must undertake a Screening Assessment at the planning application stage and provide evidence that development is appropriate.

3.2 This Basement Screening Assessment will include the following:

- Consideration of the impact of the proposals on surface water flow and flooding;
- Consideration of the impact of the proposals on groundwater flow, levels, and quality;
- Identification of suitable construction methods and mitigation measures for the proposed development; and
- Evaluation of the potential direct and indirect impacts of the proposed development.

3.3 The guidance details the stages to be included in the assessment. These are provided in the following subsections.

Initial Screening

3.4 The initial screening stage aims to identify any matters related to flooding and in particular the groundwater and surface water conditions. The initial screening questions determine if the site is located in a known area of risk.

3.5 Step 1 of the LBR Screening Assessment User Guide requires the applicant to determine if the site lies within:

- an area with >= 25% susceptibility to groundwater flooding; or
- one of the four throughflow catchment areas in LBR

3.6 The site was found to not be in a throughflow catchment area according to the LBR Further Groundwater Investigation report[2]. The site is shown to be located within two 1 km^2 grid areas where to the north Superficial Deposits Flooding > = 75% and to the south it is between > = 25% < 50 %. This is the percentage of the grid square that is considered susceptible to groundwater flooding according to the LBR SFRA[3]. This means a Screening Assessment is required.

3.7 The Screening Assessment involves providing the evidence and answers to questions provided by LBR. To undertake these questions, an understanding of the baseline subterrain characteristics, flood risk, and drainage at the site is required. The next chapter sets out this information.

[2] Metis Consultants, March 2021, Further Groundwater Investigations for LBR
[3] Metris Consultants, March 2021, LBR Strategic Flood Risk Assessment

4.0 DESK STUDY

4.1 This section of the report outlines the data and information required to answer the Subterranean Characteristics and the Flood Risk and Drainage Screening Questions of the LBR Basement Assessment User Guide.

4.2 Several data sets were used to undertake this section of the report, including the LBR Preliminary Flood Risk Assessment (PFRA)[2] and 2017 addendum[4], Strategic Flood Risk Assessment (SFRA)[5], the SFRA including updates (August 2010, March 2016[6] and September 2020[7]), and Surface Water Management Plan (SWMP) published in 2011[8] and the update in 20218[9].

Site History

4.3 At the time of the first historical plans (1893), the Site was undeveloped. The surrounding land was partially developed with individual large properties proximal to the High Street. A large park was located adjacent west, with two large ponds approximately 75 m to the west. Two ponds were located 110 m and 150 m north. The village of Hampton was located 470 m south and the River Thames 550 m south. Cardinal river was located approximately 380 m to the east. A railway was located 340 m west of the Site.

4.4 By 1912, the Site remained undeveloped. However, the ponds 75 m west, 110 m and 150 m north had been infilled and residential development of Hampton village had expanded to within 180m southwest of the Site. A rifle range was located 50 m north of the Site.

4.5 By 1947, the Site remained undeveloped. The undeveloped land adjacent west now included a skeleton road network with some residential properties. The swimming pool 50m northeast had been constructed.

4.6 By 1959, Sevenoaks had been constructed along with residential development west and north of the Site.

4.7 The Site and surrounding land generally remained in this configuration until the present day.

[4] Capita Symonds for London Borough of Richmond upon Thames, Preliminary Flood Risk Assessment, May 2011
[5] London Borough of Richmond upon Thames, Addendum Preliminary Flood Risk Assessment, December 2017
[6] Metis Consultants, London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) Update, March 2016
[7] Metis Consultants, London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) Level 1, September 2020. Updated in March 2021.
[8] Capita Symonds, Surface Water Management Plan for the London Borough of Richmond upon Thames, June 2011
[9] Metris, Surface Water Management Plan, December 2021

Geology

4.8 Reference has been made to the British Geology Society (BGS) map of the area (Sheet 270, South London, solid and drift edition, dated 1998), which indicates that the site is underlain by superficial deposits of Kempton Park Gravel Member, underlain by solid strata of the London Clay Formation. The BGS Lexicon of Named Rock Units details the Kempton Park Gravel comprises sand and gravel, locally with lenses of silt, clay and peat. While the London Clay Formation is indicated to comprise a silty clay, with layers of sandy clay and is largely impermeable. The Site geology is presented in Figures 4.1 and 4.2 below.

Figure 4.1 British Geological Survey Bedrock Geology Mapping Extract (1:50,000 scale)

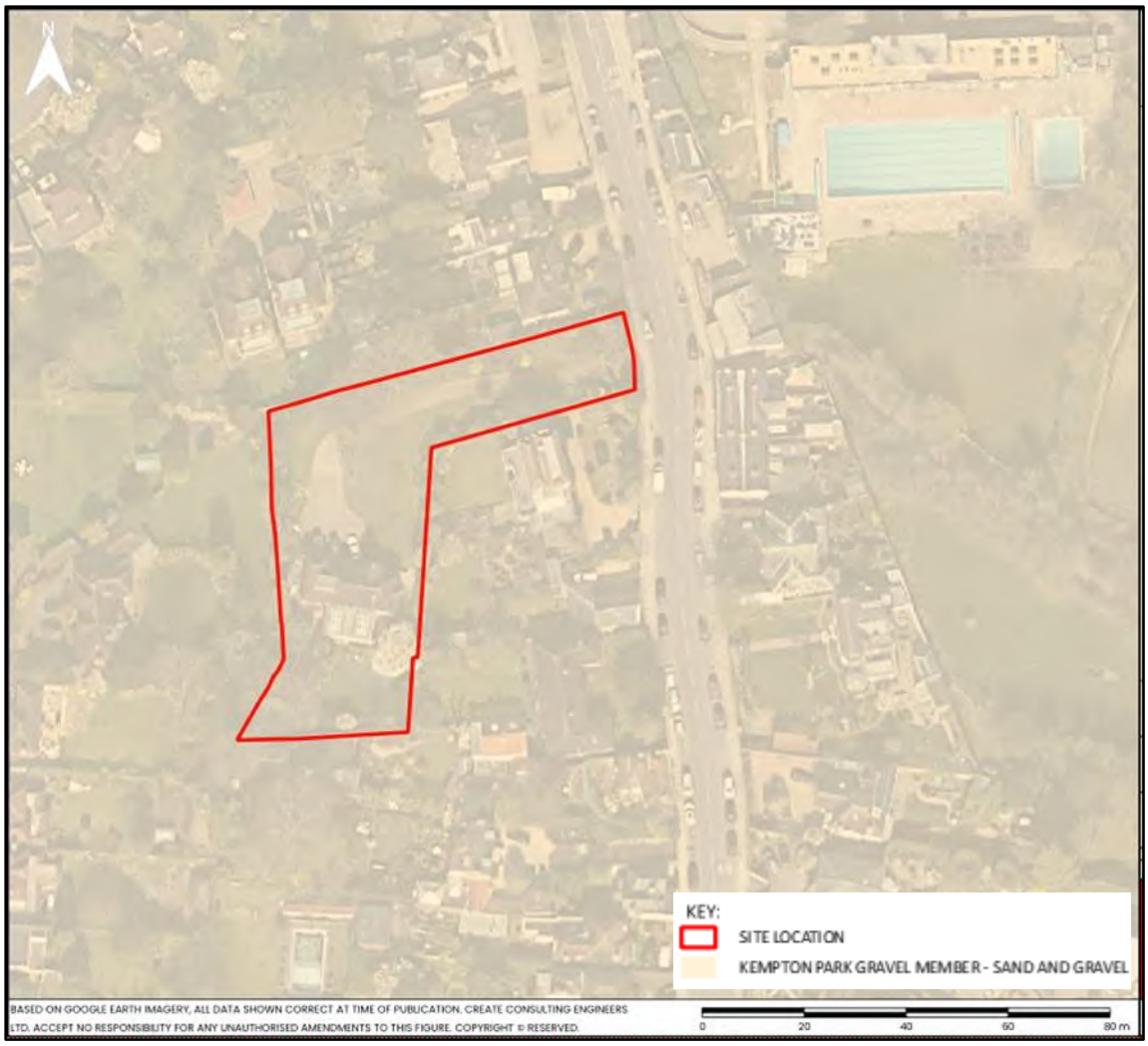


Figure 4.2 British Geological Survey Superficial Geology Mapping Extract (1:50,000 scale)

Radon

4.9 The UK radon maps indicate the Site is in a lower probability radon area, with less than 1% of properties above the action level, as detailed in Figure 4.3, below. Therefore, no radon protective measures are necessary in the construction of new dwellings at the Site.

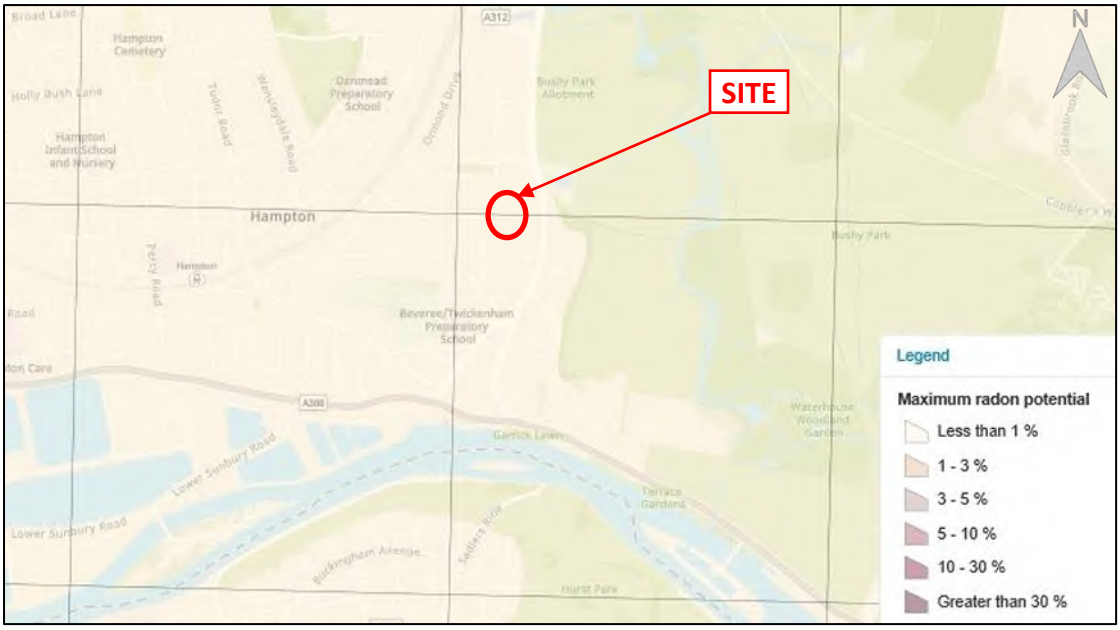


Figure 4.3: Extract of UK radon maps (.gov.uk)

Hydrogeology

4.10 The Kempton Park Gravel Member superficial deposits are classified as a 'principal' superficial deposit aquifer, defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. Meanwhile, the bedrock is classified as an 'unproductive' aquifer with low groundwater vulnerability, which is defined as rock layers with low permeability that have negligible significance for water supply or river base flow.

4.11 The groundwater vulnerability is shown to be 'Medium - High'. This suggests that ground below the site could transmit pollution to groundwater due to high leaching soils.

4.12 According to the DEFRA Magic Map, the site is not located in a groundwater Source Protection Zone (SPZ), and there are no SPZ's in the immediate local area. The nearest SPZ to the site is located approximately 6.50 km to the west of the site in Walton-upon-Thames.

4.13 Groundwater was identified between 4.00 and 6.00 m bgl in both boreholes as part of site investigation works. The presence of dry strata below this indicates that the water recorded is perched water within the permeable strata.

4.14 The discovery of water is not indicative of the true water table level in the local area. It is assumed the true water table level lies below the impermeable clay strata at the Site and the local area, which is located below the boreholes (10 m bgl) undertaken on the site.

4.15 Perched water occurs when a lens of water is present in permeable strata but cannot percolate because of impermeable strata. This allows for water to congregate in the permeable strata. This can occur above the local water table. Typically, perched water occurs

from water infiltrating into the ground during wet periods of weather. It can dry out during dry and hot periods of weather too.

4.16 The perched water is within range of the proposed basement but also the current dwelling foundations. The basement will therefore require further assessment as part of the below flood risk assessment and drainage strategy.

Historical Records of flooding

4.17 A number of sources of flood risk were investigated to determine if the site or surrounding area has been affected by floods in the past.

4.18 It has been found that the EA does not hold any records of flooding at the site.

4.19 The area to the east of High Street, approximately 35 m from the site entrance is however shown to have flooded during the winter of 2013 / 14, New year / January 2003, and December / Winter 2000[10].

4.20 The Richmond SFRA includes an interactive map of Thames Water recorded flooding incidences which shows the site to lie in an area showing up to ten incidents of sewers surcharging. This corresponds with the SWMP showing three internal incidents and zero external incidents of sewer flooding were recorded within the TW12 2 postcode.

4.21 The Richmond PFRA has recorded no instances of surface water flooding at the site or within the surrounding area.

4.22 The PFRA also contains mapping showing records of past flooding. Figure 2 - Increased potential for Elevated Groundwater, shows a groundwater flood incident recorded in an area nearby to the site. There is no evidence of this event affecting the site.

4.23 No other historical records of flooding to the site have been identified.

Flooding from Rivers and Sea

4.24 The nearest watercourse to the site is the River Thames, located approximately 560 m to the south of the site. The River Thames at this location is highly influenced by the tides (Thames Estuary) in addition to flows over Teddington weir from the upstream fluvial reach.

4.25 The site is located upstream of Teddington weir which is the tidal limit of the River Thames. As such, the site is not at risk of flooding from the tidal River Thames.

[10] EA Recorded Flood Outlines https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590 Retrieved 29th August 2024

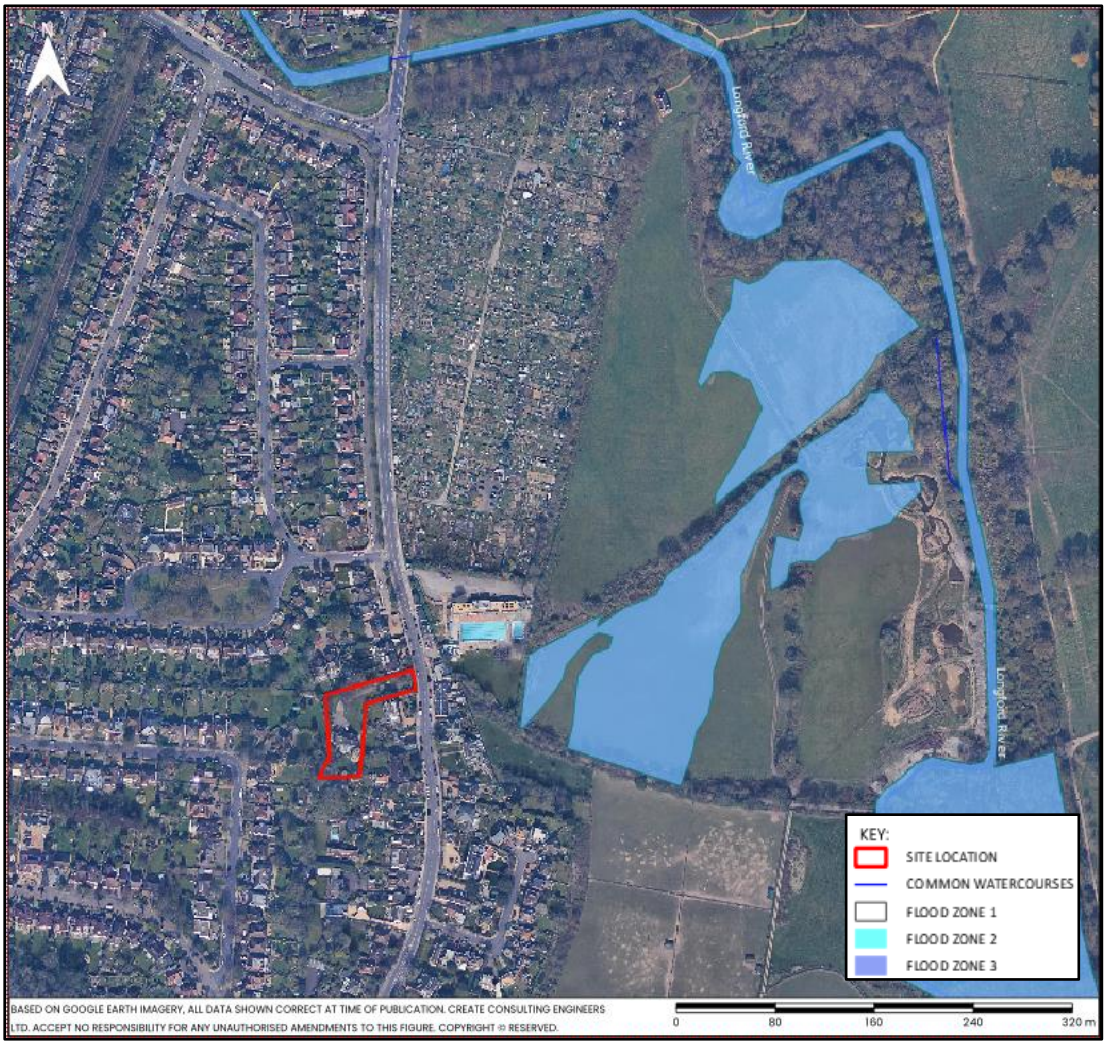


Figure 4.4: Environment Agency's Fluvial/Tidal Flood Map and Watercourses

4.26 Figure 4.4 shows the latest Flood Map for Planning[11] for the area surrounding the site and shows the site to lie within Flood Zone 1. This indicates that the risk of flooding to the site is low, with a less than 0.1% Annual Exceedance Probability (AEP) as a result of flooding from rivers or the sea. The site is at low risk of flooding from this source.

4.27 The Longford River is an EA Main River that flows through fields associated with Bushy Park approximately 430 m to the east of the site. The site is located outside the floodplain of the Longford River, according to the EA flood map and LBR SFRA. The site is therefore at low risk of fluvial flooding the Portland Brook.

[11] https://flood-map-for-planning.service.gov.uk/ Retrieved 29th August 2024

Flooding from Surface Water

4.28 Flooding from surface water can occur following intense local rainfall events when floodwater is unable to infiltrate into the ground or discharge into natural or artificial drainage infrastructure. In an urban environment, the risk of flooding from surface water and overloaded sewers is closely related, and both are included in the relevant surface water flooding datasets. Floodwater subsequently follows the topography of the local area. Surface water flooding events are typically of a short duration but can be severe.

4.29 The GOV.UK online flood mapping includes the risk of surface water flooding. These maps are a useful tool in assessing the extent and frequency of flooding in a general area but do come with a caveat that they should not be used for site specific development or property level. Therefore, engineering judgement is required when using these maps for this purpose.

4.30 Figure 4.5 illustrates the GOV.UK surface water flooding extent map for the site and surrounding area (RofSW). The dark blue shaded areas show locations of high surface water flood risk, which have a greater than 3.3% (1 in 30) annual probability of flooding, lighter blue areas show medium risk of between 3.3% and 1% (1 in 100) annual probability of flooding and the pale blue areas indicate low risk regions of between 1% and 0.1% (1 in 1000) annual probability of flooding. Areas that are not highlighted in blue are classed as having a very low risk of surface water flooding, with a less than 0.1% annual probability of flooding.

4.31 Figure 4.5 shows the site to lie predominantly in an area defined as ‘very low’ risk, including the proposed development footprint. The wider site however is subject to both ‘low’ and ‘medium’ risks over part of the existing driveway and to the northwestern corner of the site boundary. The access point to the Site from the High Street is also subject to ‘medium’ risk associated with a flow path within the carriageway of the road itself.

4.32 Figure 4.6 below shows flow directions of the modelled flooding for the 0.1% event. To the northwest of the site this shows no clear direction of flow, indicating natural ponding of rainfall which is not connected to any identified flow path. To the northeast there is also ponding however this is shown to flow beyond the site to the southeast. This is likely associated with the uppermost depths of flooding however, as the depth mapping is shallower within the flow corridor than within the ponding, indicating an amount of ponding occurs before levels are sufficient to flow to the southeast.

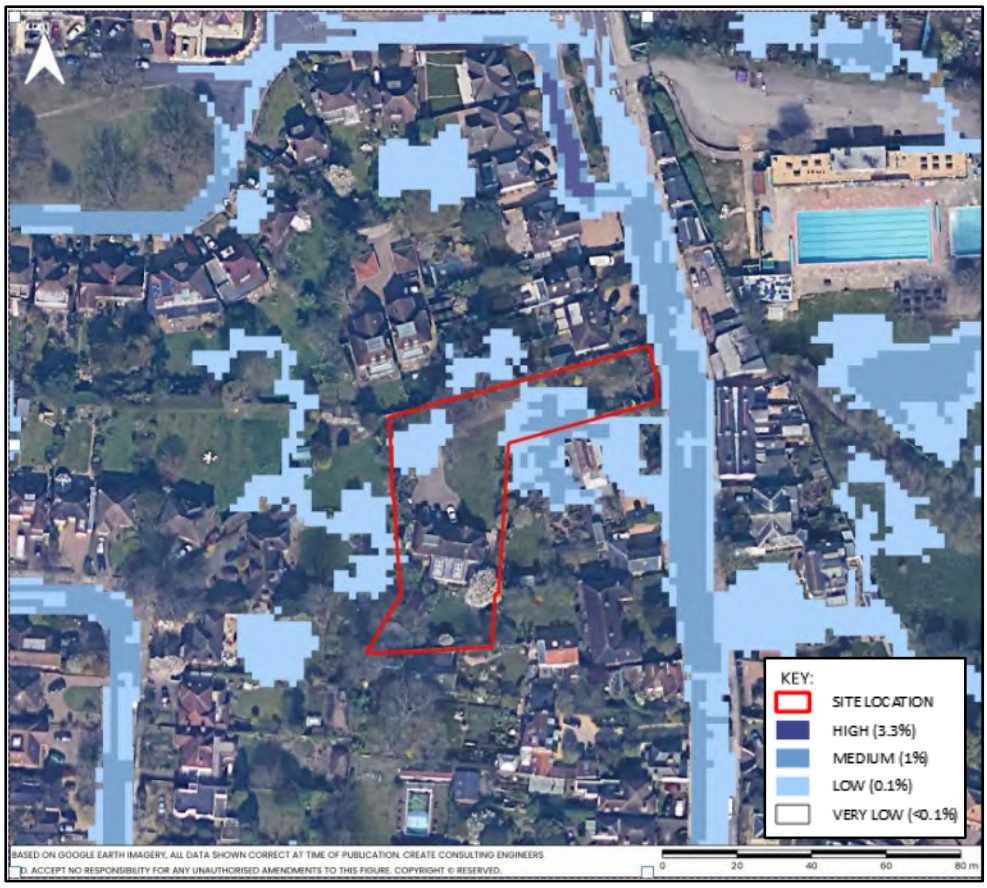


Figure 4.5: Surface Water Flood Extent Map.

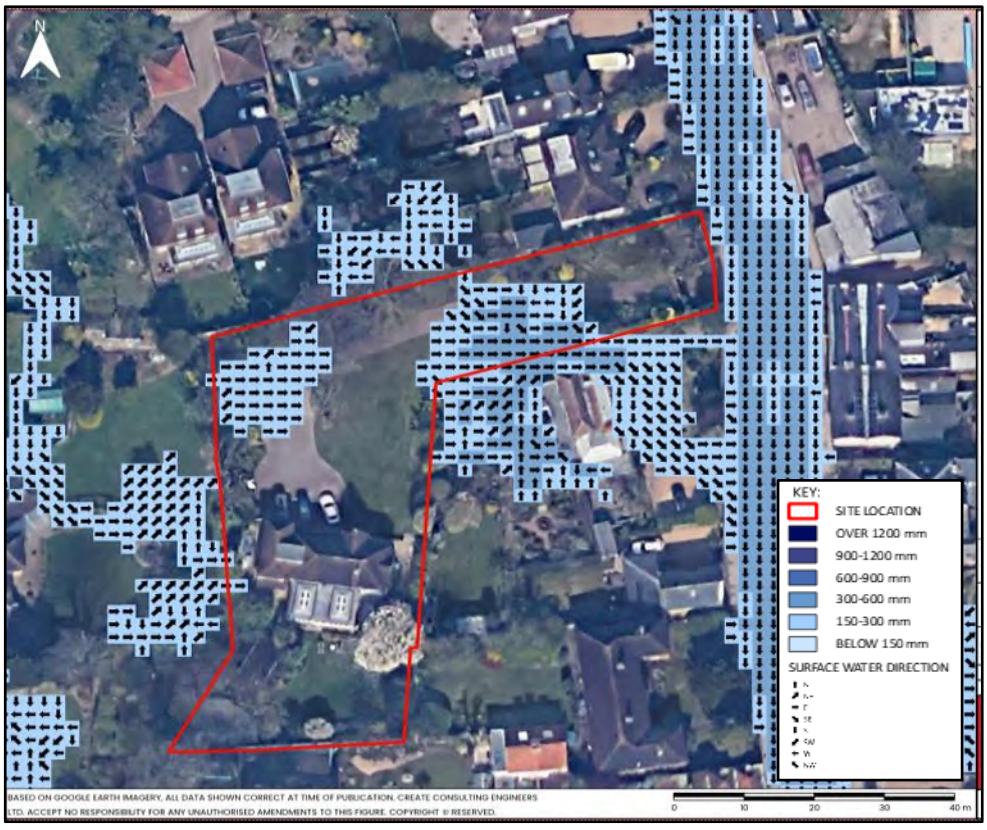


Figure 4.6: Surface Water Flood Depths Map 1 in 1000 Year Event (0.1% AEP)

4.33 The surface water flooding on the Site is associated with topographic depressions and natural valleys, and such is the case with the surface water flooding shown over the driveway[12].

4.34 The site is therefore at potential risk of surface water flooding and further investigation must be undertaken to better understand the risks to the site and development.

Risk of Flooding from Sewers

4.35 Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of sewers. Flooding from sewers and highways is linked to the risk of flooding from surface water in urban areas, with the exact source of flooding often indistinguishable.

4.36 A plan showing the location of Thames Water sewer assets close to the site is provided in the Appendix. The plans show a foul sewer operated and maintained by Thames Water running within High Street.

4.37 The Thames Water sewer runs north to south; a connection is not shown to the proposed development site, but it is assumed a connection exists to the existing dwelling. A small number of surface water sewers are also shown on the map provided, serving one or two properties before connecting to the foul sewer shown within High Street.

4.38 Thames Water were contacted for information regarding sewer flooding at the site and their records indicate that there have been no incidents of flooding at the site as a result of surcharging public sewers. A copy of this correspondence is provided in Appendix A.

4.39 As mentioned previously in the preceding Historical Records of flooding section. The Richmond SFRA includes an interactive map of Thames Water recorded flooding incidences, taken from the DG5 register, which indicates that there have been up to three incidences of sewer flooding recorded within the area containing the site.

4.40 The basement extension will include a sump pump arrangement as outlined in the LBR Good Practice Guide for Basements[13]. These devices are to be fitted on the foul and surface water outlets to reduce the risk of internal sewer flooding from surcharging sewers which could be serving the property position.

[12] https://www.gov.uk/check-long-term-flood-risk Retrieved 29th August 2024

[13] London Borough of Richmond upon Thames, May 2015, Planning Advice Note, Good Practice Guide on Basement Developments

Risk of Flooding from Groundwater

4.41 As mentioned previously in the preceding Hydrogeology section the site is underlain by the Kempton Park Gravel Member which is a superficial deposit classified as a 'principal' aquifer. The groundwater vulnerability is also shown to be 'Medium - High'.

4.42 The site ground investigation supports this, with findings confirming sands and gravels over the London Clay Formation. The geology at the site is therefore generally permeable over impermeable.

4.43 Perched water was encountered at between 2.00 to 4.00 m bgl in both boreholes, above dry strata.

4.44 A risk of groundwater flooding therefore exists, due to perched water over impermeable base geology (London Clay).

Risk of Flooding from Other Sources

4.45 The EA Long Term Flood Risk from artificial sources map shows that the area surrounding the site would not be affected by reservoir flooding in the event of a nearby reservoir failure (Figure 4.7).

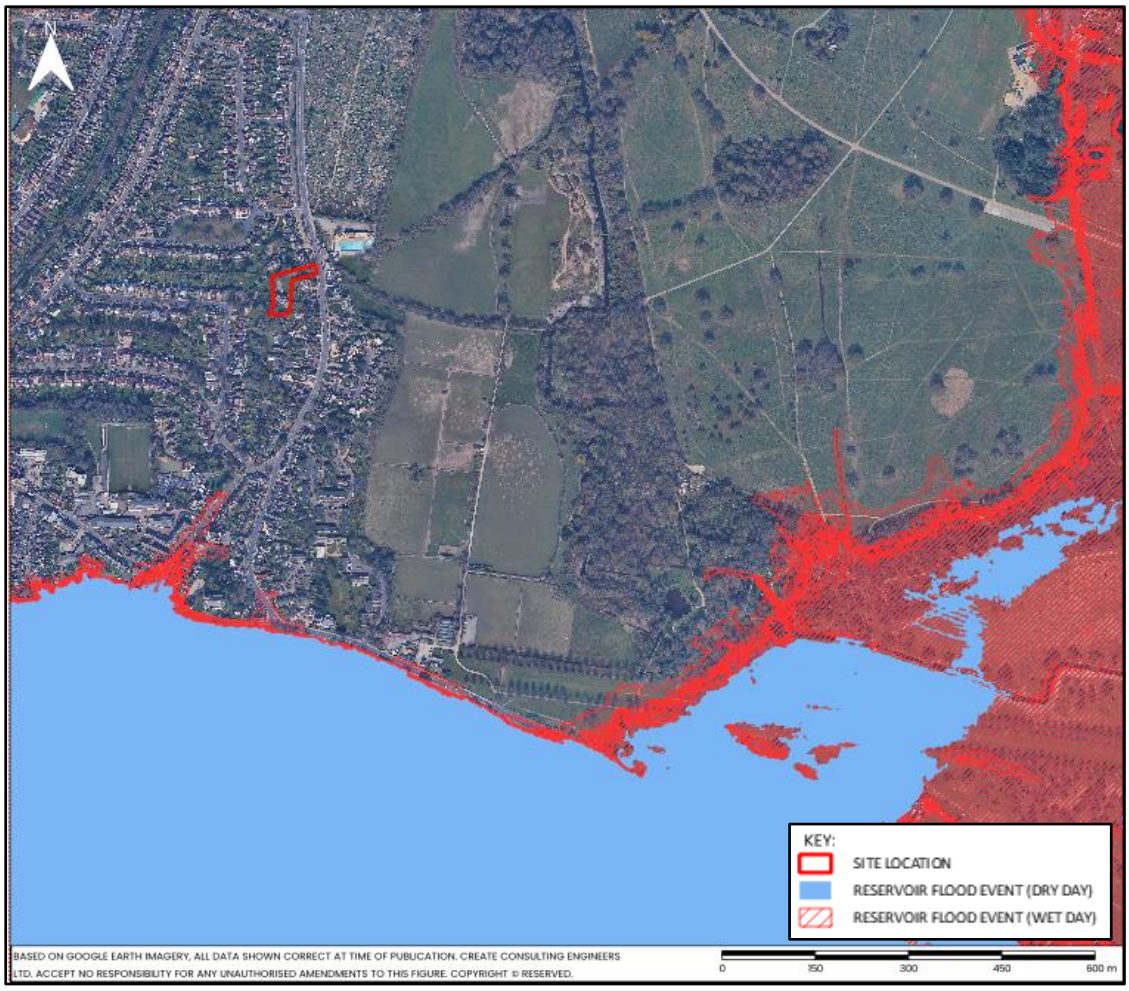


Figure 4.7 Environment Agency's Risk of Flooding from Reservoirs

4.46 The site is therefore not considered at risk of reservoir flooding and there are no further artificial waterbodies in the area that would constitute a significant risk of flooding to the site.

4.47 There are no other sources of flooding that present a risk to the site.

Climate Change

4.48 The projected impacts of climate change are likely to cause long term variations in the probability and risk of flooding. The risk of flooding from groundwater is generally likely to be reduced due to reduced winter rainfall and a move to more intense summer storms which cannot infiltrate into the ground, but risks from other sources are likely to increase. This will affect the site in terms of the likelihood of flooding from surface water and this has been taken into consideration throughout this assessment in accordance with the latest government guidance.

Impact of Flooding Elsewhere

4.49 There is a potential for peak surface water runoff flows and volumes of runoff from the site to increase where proposed development increases the impermeable areas on the site or reduces the critical drain time. This will be addressed within the Sustainable Drainage section of this assessment to ensure that runoff rates are not increased, and therefore that there is no adverse impact to third parties.

Summary of Flood Risk

4.50 The site has been shown to be at potential risk of surface water and groundwater flooding. All other sources of flood risk were found not to affect the site or the proposed development. It is therefore necessary to undertake a Flood Risk Assessment for the proposed development.

4.51 There is a risk that the development could affect the risk of flooding downstream due to increased rates of runoff arising from increased proportions of man-made surfaces on the site and the future effects of climate change. It is therefore necessary to undertake a drainage assessment for the proposed development.

Unexploded Ordnance (UXO)

4.52 There is the potential for UXO at the Site, with the Zetica unexploded ordnance (UXO) maps designating the Site as being within a 'moderate to low' risk zone from UXO, as detailed in Figure 4.8, below.

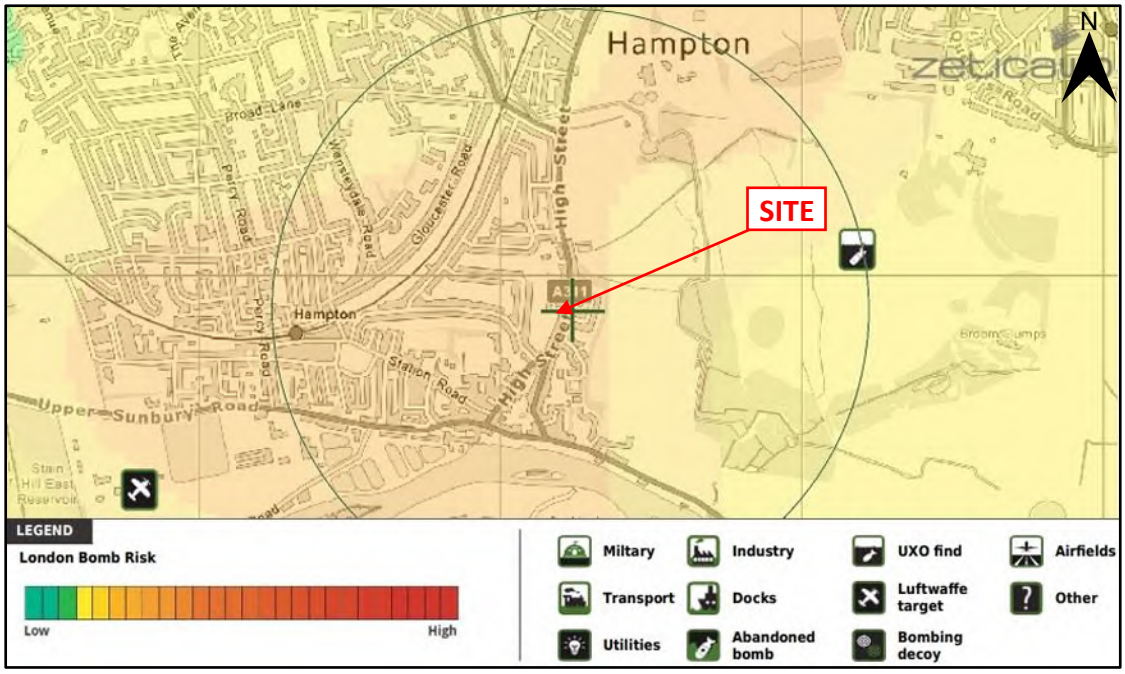


Figure 4.8 UXO risk map (Zetica)

Trees

4.53 There are 29 mature trees within the Site boundary, as presented within Figure 4.9, below.

Figure 4.9: Tree layout (Merewood Arboricultural Consultancy Services)

Ecology and Habitats

4.54 Bushey Park is approximately 100 m east of the Site is designated as a SSSI (Site of Special Scientific Interest) and a designated woodland priority habitat is located 360 m east of the Site, as detailed in Figure 4.10, below.

Figure 4.10: Ecology and Habitats

Listed Buildings and Conservation Areas

4.55 The Site is located within Hampton 'historic village core' conservation area, with the Station Road conservation area located approximately 280m to the southwest. A listed building is located proximal to the Site's eastern boundary. Additional list buildings within the vicinity of the Site are located 18m southeast, 40m east, 80m east and 100m southeast of the Site, as detailed in Figure 4.11, below.

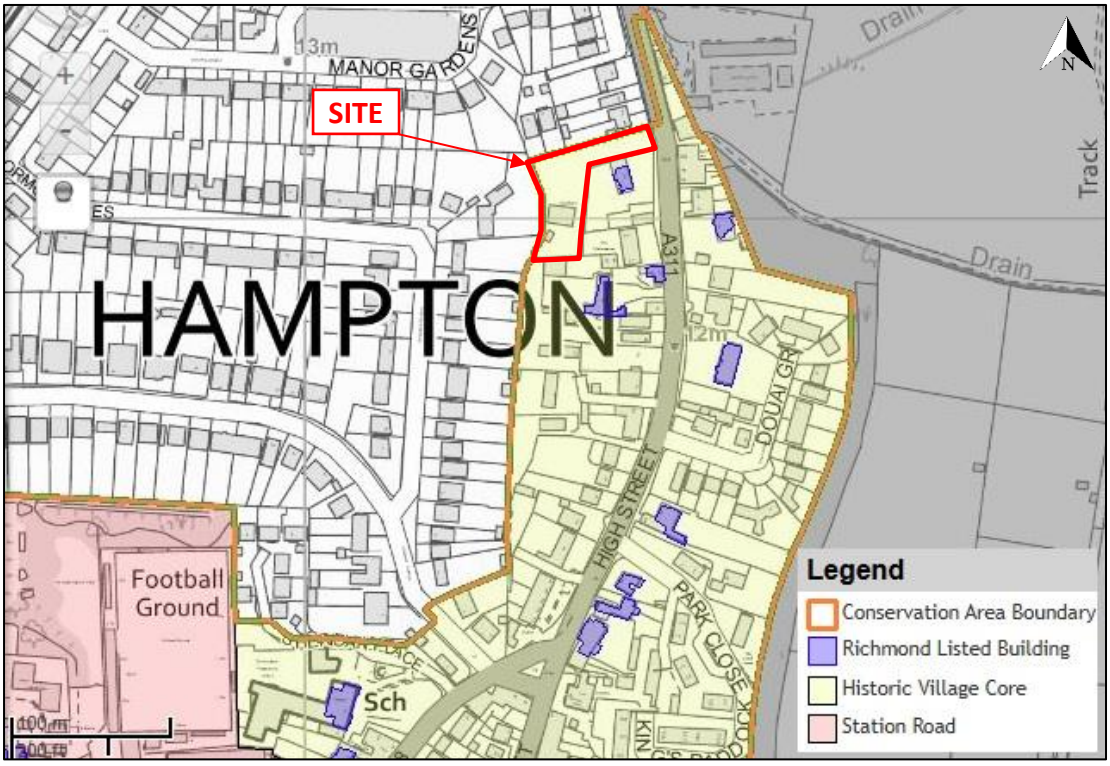


Figure 4.11: Listed Buildings and Conservation Areas (Richmond.gov.uk)

Below ground Utility Services

4.56 Statutory services of gas, water, electricity, drainage and fibreoptics are indicated to enter the Site through the main gate and follow the line of the driveway before entering the existing building. A separate drain is indicated to the rear of the property, exiting east to the neighbouring property.

London Underground

4.57 The location of the London underground lines were confirmed using the ARCGIS online information providing a true representation of the London underground network in relation to the Site. No London Underground assets are indicated within the vicinity of the Site, as detailed in Figure 4.12, below.

London Overground

4.58 The closest overground rail route to the Site is approximately 350m west of the Site, as detailed in Figure 4.12, below.

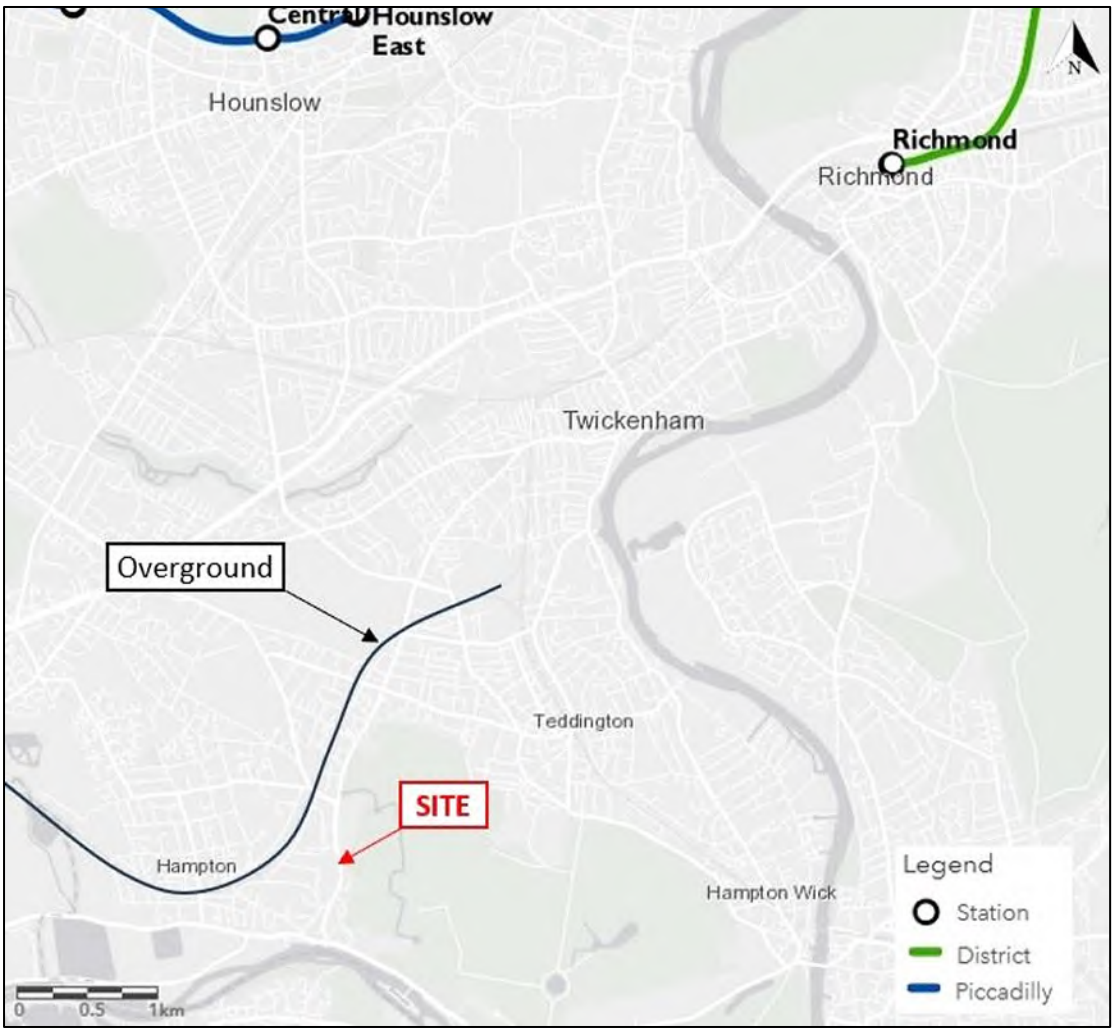


Figure 4.12: True Geography of the London Underground

5.0 SCREENING ASSESSMENT

5.1 From the initial data collection, the Subterranean Characteristics, Land Stability and Flood Risk and Drainage Screening Assessment can be undertaken. Any "No" responses do not require further consideration according to the LBR Basement Assessment User Guide. Only the matters that have a "Yes" or "Unknown" response need to be taken forward and investigated as part of the BIA.

Subterranean Characteristics

1) Does the recorded water table extend above the base of the proposed subsurface structure?

Answer: Unknown

The Site geology is indicated to comprise the permeable Kempton Park Gravel Member, underlain by impermeable strata of the London Clay Formation. The proposed development will include a basement with FFL at 3.0m bgl. At this stage, Site groundwater levels are not known.

A Site specific ground investigation, including groundwater monitoring standpipes will help determine the Site groundwater regime. An assessment of the flooding risks and potential mitigation measures will be required as part of the following flood risk assessment.

2) Is the proposed subsurface development structure within 100 m of a watercourse or spring line?

Answer: No

There are no watercourses, wells, or known spring lines within a 100 m radius of the site. This has been established via the use of the Flood Map for Planning, and Ordnance Survey (OS) maps in combination with BGS maps and DEFRA Magic Map.

The site is located approximately 560 m north of the River Thames and 430m west of Longford River. There are no other known watercourses located closer to the site.

3) Are infiltration methods proposed as part of the site's drainage strategy?

Answer: Unknown

The Site is indicated to be underlain by the Kempton Park Gravel, which are potentially suitable for the discharge of surface water to the ground. However, the use of infiltration will be subject to detailed assessment.

4) Does the proposed excavation during the construction phase extend below the local water table level or spring line (if applicable)?

Answer: Unknown

Subject to confirmation by means of a Site specific ground investigation and monitoring of groundwater, an assessment of basement interaction with local groundwater levels can be made. Groundwater monitoring will enable an assessment of the flooding risks from groundwater and potential mitigation measures required as part of the following flood risk assessment.

5) Is the most shallow geological strata at the site London Clay?

Answer: No

5.2 The BGS maps, as outlined in the Desk Study (Section 4), indicate the site is underlain by superficial deposits of the Kempton Park Gravel Member which are underlain by the London Clay Formation.

6) Is the site underlain by an aquifer and /or permeable geology?

Answer: Yes

5.3 The published BGS maps, as outlined in the Desk Study (Section 4), indicate the site to be underlain by the superficial Kempton Park Gravel Member, which is classified as a Principal Aquifer. The Kempton Park Gravel Member are indicated to be underlain by the London Clay, which is classified as a non-aquifer.

Land Stability

1) Does the Site, or neighbouring area, topography include slopes that are greater than 7°?

Answer: No

The topography of the Site and surrounding area is generally level. Topographical maps of the Site and surrounding area, as presented within the 'Plans' section to the rear of this report, detail ground levels of between 12.0m and 13m aOD. Hampton Court Road, proximal to the River Thames, 550m to the south is at approximately 12.0m aOD.

2) Will changes to the Site's topography result in slopes that are greater than 7°?

Answer: No

The proposed development will include localised landscaping, but will not include changes to Site levels.

3) Will the proposed subsurface structure extend significantly deeper underground compared to the foundations of the neighbouring properties?

Answer: Yes

The proposed development will include a basement with FFL of 3.0m bgl (9.6m aOD). With an allowance of 800mm for basement slab, waterproofing and insulation, formation level will be at approximately 8.8m aOD.

4) Will the implementation of the proposed subsurface structure require any trees to be felled or uprooted?

Answer: Yes

As outlined in the Desk Study (Section 4 of this report), the proposed development will result in the removal of three trees.

5) Has the ground at the Site been previously worked?

Answer: No

As outlined within the Desk Study (Section 4), the Site was undeveloped until sometime between 1947 and 1959 when the current building (Sevenoaks) was built.

6) Is the Site within the vicinity of any tunnels or railway lines?

Answer: No

As Outlined within the Desk Study (Section 4), the Site is outwith the bounds of the London Underground network and the closest overground railway is approximately 350m west of the Site.

<u>Flood Risk And Drainage</u>

5.4 From the initial data collection and ground investigation on the site (outlined in Chapter 4), the Flood Risk and Drainage Screening Assessment can be undertaken.

7) Will the proposed subsurface development result in a change in impermeable area coverage on the site?

Answer: No

The proposals for the new basement will not increase impermeable coverage on the site. Although the proposals for site do include an increased impermeable footprint over the existing dwelling, the basement will not extend beyond the footprint of the proposed upper floors.

8) Will the proposed subsurface development impact the flow profile of throughflow, surface water or groundwater to downstream areas?

Answer: Unknown

At this stage, Site groundwater levels are not known. Subject to a Site specific ground investigation and long-term monitoring of groundwater levels, an assessment of any impact upon groundwater throughflow can be made.

The site is at risk of surface water flooding as shown in the GOV.UK Long Term Flood Risk maps. However, the area occupied by both the existing and proposed buildings is not within the mapped areas of flood risk and will therefore not affect the flow profile of surface water.

The proposed development will, however, influence a change in the surface water runoff due to the change in impermeable coverage post development. The proposed development will need to be resilient to climate change by assuming an increased rate of runoff in accordance with national guidelines over the development lifetime.

9) Will the proposed subsurface development increase throughflow or groundwater flood risk to neighbouring properties?

Answer: Unknown

At this stage, Site groundwater levels are not known. Subject to a Site specific ground investigation and long-term monitoring of groundwater levels, an assessment of any impact upon groundwater throughflow and groundwater flood risk to neighbouring properties can be made.

6.0 SCOPING

6.1 The Screening Assessment has brought forward the following points for further assessment within the BIA:

Subterranean Characteristics

6.2 The screening process identifies the following issues to be carried forward to scoping for further assessment:

- Does the recorded water table extend above the base of the proposed subsurface structure?
- Are infiltration methods proposed as part of the Site's drainage strategy?
- Does the proposed excavation during the construction phase extend below the local water table or spring level (if applicable)?
- Is the Site underlain by an aquifer and / or permeable geology?

Land Stability

6.3 The screening process identifies the following issues to be carried forward to scoping for further assessment:

- Will the proposed subsurface structure extend significantly deeper underground compared to the foundations of the neighbouring properties?
- Will the implementation of the proposed subsurface structure require any trees to be felled / uprooted?

Flood Risk and Drainage

6.4 The screening process identifies the following issues to be carried forward to scoping for further assessment:

- Will the proposed subsurface development impact the flow profile of throughflow surface water or groundwater to downstream areas?
- Will the proposed subsurface development increase throughflow or groundwater flood risk to neighbouring properties?

6.5 It has been established that there is a risk of flooding from surface water to the Site and this needs to be assessed against the current and proposed development.

6.6 The proposed development will extend into permeable sub-strata and therefore the risk of interactions with groundwater must be considered.

6.7 The proposed development will increase the impermeable areas on the site. The site drainage will not materially alter following development. However, in accordance with current policy, new development should consider increases in runoff both due to increases in hard surfaces, and accounting for climate change over the lifetime of the development.

6.8 A detailed investigation into the risk of flooding from surface water and groundwater sources (Chapter 10) and a SuDS assessment (Chapter 10) have therefore been completed to address these potential issues.

6.9 The proposed basement will extend deeper than neighbouring properties. A Site specific ground investigation was undertaken to confirm ground conditions at the Site and the groundwater regime, the results of which are discussed in Chapter 9 of this report.

6.10 An arboricultural assessment of Site trees was undertaken to determine the impact of the proposed development upon Site trees, the results of which are discussed in Chapter 9 of this report.

7.0 BASEMENT IMPACT ASSESSMENT – GROUND MOVEMENT

7.1 To help determine ground conditions at the Site, a Site-specific ground investigation comprising of two boreholes (BH01 and BH02) was undertaken on 3rd September 2024. An exploratory hole location plan is presented in Appendix B, along with the exploratory hole logs. Ground conditions comprised.

Topsoil and Made Ground

7.2 Topsoil was recorded from ground level to 0.30 m bgl, underlain by Made Ground to 0.90 m bgl. The Made Ground was generally described as 'soft brown slightly silty clay, with traces of brick'.

Head

7.3 Head deposits were recorded to depths of between 1.70 m and 2.30 m bgl, equating to thicknesses of between 0.80 m and 1.40 m. The Head was generally described as: '*firm brown slightly gravelly sandy CLAY. The gravel comprised subrounded fine to medium siltstone*'. A single in-situ strength tests (SPT) undertaken within the Head recorded a N-value of N=15, confirming the material description of 'firm'.

Kempton Park Gravel Member

7.4 The Head deposits were underlain by the Kempton Park Gravel Member to depths of between 4.70m and 4.80m bgl, equating to thicknesses of between 2.35m and 3.0m. The Kempton Park Gravel Member was described as: '*medium dense brown subangular to subrounded fine to coarse SAND AND GRAVEL*'. A total of five SPTs were undertaken within the Kempton Park Gravel Member, recorded N-values in the range of $(N_1)_{60}$ = 14 and $(N_1)60$ = 27 and were generally seen to increase in value with depth, as detailed in the SPT depth plot, Appendix D.

7.5 Geotechnical laboratory testing undertaken on samples from the Kempton Park Gravel comprised of two particle size distribution tests (PSD), as summarised in Table 7.1, below, with the laboratory test certificates presented in Appendix C.

Table 7.1: Summary of Kempton Park Gravel laboratory testing

Test	No. of Tests	Grain Size	Result (%)
PSD	2	Cobbles	0.0
		Gravel	26 and 80
		Sand	19.7 and 54
		Silt and Clay	0.3 and 20

7.6 The laboratory geotechnical test results indicate the Kempton Park Gravel predominantly comprises sand and gravel.

London Clay Formation

7.7 The superficial deposits were underlain by solid strata of the London Clay Formation to the maximum depth of the boreholes, 10.0m bgl. The London Clay Formation was described as: '*firm grey mottled brown slightly silty CLAY*'. A total of 8No. SPTs were undertaken within the London Clay, recording N-values in the range of N_{60} = 12 to N_{60} = 30 and were generally seen to increase in strength with depth, as detailed in the SPT depth plot, Appendix D.

7.8 Geotechnical laboratory testing of samples from the London Clay are summarised in Table 7.2, below, with laboratory test certificates presented in full in Appendix C.

Table 7.2: Summary of the London Clay laboratory testing

Test	No. of Tests	Result
Modified plasticity	2	45% and 41%
Moisture content	2	23.8% and 31.3%
pH	2	8.3 and 8.4
Total soluble sulphate SO_4 (2:1 extract)	2	0.01g/l and 0.053g/l
Total sulphur	2	0.13% and 0.40%

7.9 The plasticity test results record the London Clay as predominantly comprising silt.

Buried Concrete

7.10 Based on the chemical laboratory test results (BRE SD1 suite) and in accordance with BRE Special Digest 1: 2005 (Concrete in Aggressive Ground), the following criteria have been determined. A total of two BRE SD1 chemical suits were undertaken on soil samples from the London Clay Formation.

7.11 The Site is classified as 'natural ground' and the local geology (London Clay) is indicated to contain pyrite (i.e., sulphide) and groundwater conditions are considered to be 'mobile'. Laboratory chemical testing recorded water soluble sulphate concentrations in the soil of between 10mg/l and 53mg/l, total sulphur concentrations of between 0.01% and 0.031% and total potential sulphate is calculated as between 0.03% and 0.09%. The calculated oxidised sulphides are between 0.02% and 0.06%. The concentration of oxidised sulphides are greater then 3% of the total potential sulphate content for both samples. Therefore, sulphates are present.

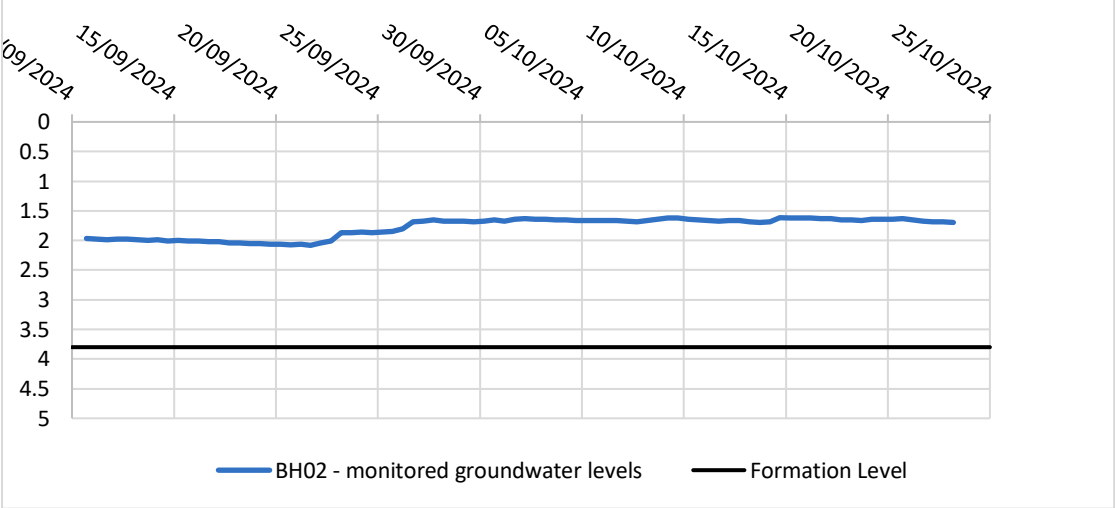
7.12 On the basis of the test results, the Design Sulphate Class for the Site is considered to be "DS-1". pH values of between 8.3 and 8.4 were also recorded. Therefore, the "Aggressive Chemical Environment for Concrete (ACEC)" class for concrete in the ground is indicated to be AC-1d.

Groundwater

7.13 During exploratory hole formation, groundwater strikes were recorded at depths of between 2.16m and 2.45m bgl. Subsequent long-term monitoring by means of a data logger (reading every 12 hrs) recorded groundwater at depths of between 1.62 m bgl and 2.08m bgl, with an average of 1.78m bgl over a six week period (10/09/2024 to 23/10/2024).

7.14 Groundwater levels were relatively constant, with the depth to water decreasing slightly towards the end of September. The groundwater monitoring results are summarised in Chart 7.1, below and presented in full in Appendix E. Monitoring is ongoing and is planned for 12 months/one year, with results presented separately upon completion.

Chart 7.1: Monitored groundwater levels



Site Ground Model

7.15 Based on the Site specific ground investigation, the following ground model, as presented in Table 7.3 has been derived for the Site.

Table 7.3: Ground Model

Lithology	Depth to Base (m)	Unit Weight (kN/m^3)	c' (kN/m^2)	phi (°)
Made Ground	0.9	17.5	-	-
Head	2.1	18	45	5
Kempton Park Gravel	4.7	21	-	36
London Clay	>10.0m	19	72	5
Groundwater	1.78 m bgl (10.82 m AOD)			

Ground Movement Assessment

7.16 Based on the ground model, to ascertain if the proposed development will adversely impact upon proximal properties, following the guidance of CIRIA C760, a ground movement assessment has been undertaken, as presented in Appendix F.

7.17 Formation level for the proposed basement is 3.80m bgl, with the indicated method of construction is for the excavation sides to be battered back at an angle of 45 degrees. However, with groundwater at approximately 1.80m bgl, excavating below the water table will be technically challenging, with an expensive dewatering programme required. Therefore, to enable dewatering and controlled basement excavation, some form of temporary works are proposed: sheet piles, socketed into the impermeable London Clay. There is a possibility sheet piles will not penetrate the dense sand and gravel, and it is recommended a piling contractor with local knowledge is consulted to recommend an appropriate design.

7.18 The closest property to the proposed basement is approximately 20m to the south. The proposed method of construction is for excavation with temporary propping. The basement slab and walls are then formed. On this basis, the closest property is outwith the zone of influence from wall construction and basement excavation and the impact from basement construction will be negligible (Burland scale of damage). Services within the High Street will not be impacted by the proposed basement construction.

Arboricultural Assessment

7.19 To assess any impact the proposed development will have on existing trees, an arboricultural assessment was undertaken by Merewood arboricultural. The arboricultural report states there are 29 trees within the Site boundary, of which are classified as:

- 4No. category ‘A’;
- 9No. category ‘B’; and
- 16No. Category ‘C’ trees.

7.20 Where, category A trees are those of the highest quality and value, category B are trees of moderate to high quality and value and category C trees are of low quality and value.

7.21 The proposed development will include the removal of 3No. category ‘C’ trees: T22 (Chusan Palm), T23 (Cabbage Palm) and T24 (Cabbage Palm), as detailed in Figure 7.1, below. For reference, the Merewood report is included within Appendix G.

7.22 The three palms are indicated to be of low water demand and their removal will not result in ground heave and impact upon the proposed development or proximal properties.

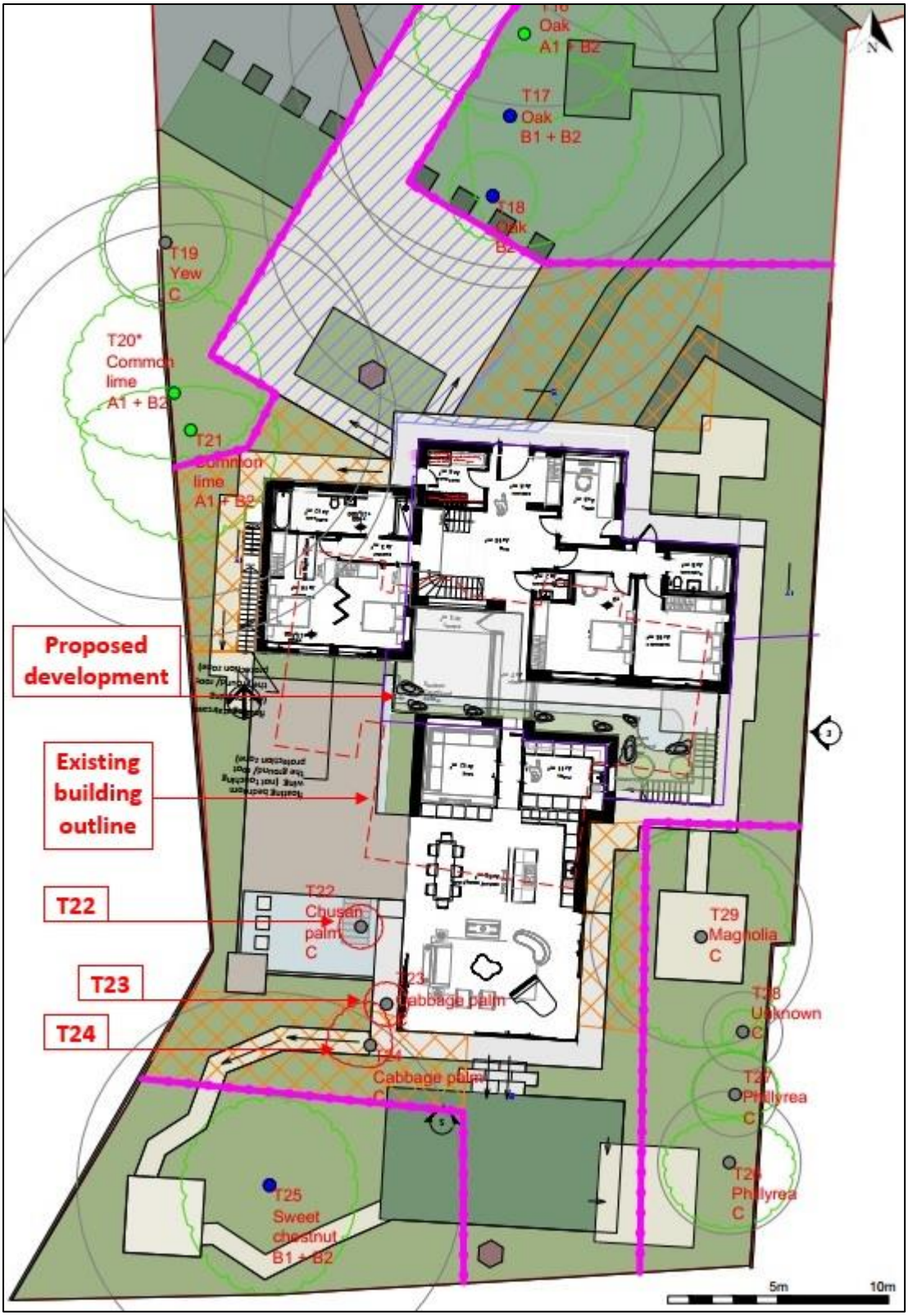


Figure 7.1: Trees to be removed with existing building and proposed development

8.0 BASEMENT IMPACT ASSESSMENT - FLOOD RISK ASSESSMENT

8.1 The screening and scoping stages of the BIA have highlighted the need for a detailed assessment into the risk of flooding from surface water sources.

Policy - Flood Risk

National Planning Policy Framework

8.2 The revised National Planning Policy Framework (NPPF) was updated December 2023 and sets out the Governments' planning policies for England and how these are expected to be applied. In terms of flooding, the NPPF states that:

''Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere. "

8.3 The accompanying Planning Practice Guidance (PPG) for Flood Risk and Coastal Change clarifies which development types are considered appropriate within each flood zone. The PPG is updated online on a regular, ongoing basis.

Local Policy – LBR

8.4 The SFRA indicates that it is essential that developers consider the possible change in flood risk over the lifetime of the development, as a result of climate change. The lifetime of residential developments should be considered for a minimum of 100 years unless there is specific justification for considering a shorter period.

Surface Water

8.5 The initial data collection section of this report (Chapter 4) highlighted that the site lies within an area defined at 'Low' to ‘Medium’ risk of surface water flooding. This section of the report undertakes the required further investigation and analysis of the GOV.UK surface water maps.

8.6 The GOV.UK online flood mapping[14] includes the risk of surface water flooding. These maps are a useful tool in assessing the extent and frequency of flooding in a general area but do come with a caveat that they should not be used for site specific development or property level. Therefore, engineering judgement is required when using these maps for this purpose. The EA maps showing the risk of flooding from the surface water map, applicable to the site, is shown in Figure 4.5.

[14] Available at: https:llcheck-long-term-flood-risk.service.gov.uk/risk [Accessed November 2024]

8.7 The design flood event is the 1% AEP plus climate change event. It is important to note that these maps do not include future climate change, therefore it is common practice to evaluate the 1% AEP event as well as the 0.1% AEP. In this way, a precautionary approach is to use the 0.1% AEP as a surrogate for the design event, the 1% AEP plus climate change event. The 0.1% AEP flood depths and directions are shown in Figure 4.6.

8.8 Figure 4.6 shows that the site is predicted to experience some isolated surface water ponding during the 0.1% AEP surface water flood event. Much of the shown flooding is up to 300 mm in depth, with the odd area being up to 600mm. It should be noted that there is no surface water flooding shown around the current dwelling.

8.9 Using the 0.1% AEP event[15] as a surrogate for the design event (1% AEP + climate change), the surface water flood maps have been compared to the topographic survey and the isolated surface water pooling is shown to have a flood water level of around 12.50 m AOD.

8.10 The boundary wall and fence line will reduce the surface water pooling encroaching onto the Site from neighbouring properties. The surface water mapping does not take into account fence or wall lines.

8.11 The proposed development is not located in an area shown to be at risk of surface water flooding. However, in accordance with CIRIA Designing for Urban Exceedance, finished floor level or threshold levels should be set 75-150 mm above the surrounding ground levels to allow for some resilience to any unforeseen flooding from surface water flooding.

8.12 The site is at risk of flooding from surface water as shown on the surface water mapping, but the proposed development is to be located in an area at very low risk. Even with the proposed development being located in an area of very low risk, it is still recommended to have raised thresholds and finished floor levels in line with CIRIA to prevent the ingress of water.

Groundwater Risk

8.13 The site-specific ground investigation, as detailed in Section 7 of this report, recorded: Made Ground soils to 0.90m, Head deposits to depths of between 1.70m and 2.30m, the Kempton Park Gravel Member to 4.70m bgl, underlain by the impermeable London Clay Formation. Groundwater monitoring over a six week period has recorded groundwater at levels of between 1.62m and 2.08m bgl.

8.14 The Kempton Park Gravel Member superficial deposits are classified as a 'principal' superficial deposit aquifer, defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. Meanwhile, the bedrock is classified as an 'unproductive' aquifer with low groundwater vulnerability,

[15] https://www .data.gov.uk/dataset/lf3d6e13-40fl-4d12-99de-77132bcl9c47/risk-of-flooding-from-surface-water-extent-0-1- percent-annual-chance

which is defined as rock layers with low permeability that have negligible significance for water supply or river base flow.

8.15 The groundwater vulnerability is shown to be 'Medium - High'. This suggests that ground below the site could transmit pollution to groundwater due to high leaching soils.

8.16 The site was found to not be in a throughflow catchment area according to the LBR Further Groundwater Investigation report[16]. The site is shown to be located within two 1 km^2 grid areas where to the north Superficial Deposits Flooding > = 75% and to the south it is between > = 25% < 50 %. This is the percentage of the grid square which is considered susceptible to groundwater flooding according to the LBR SFRA[17].

8.17 No records of groundwater flooding affecting the site, or the surrounding area have been found as part of the LBR SWMP, SFRA or LFRMP.

8.18 According to the DEFRA Magic Map, the site is not located in a groundwater Source Protection Zone (SPZ), and there are no SPZ's in the immediate local area. The nearest SPZ to the site is located approximately 6.50 km to the west of the site in Walton-upon-Thames.

8.19 Groundwater within the superficial Kempton Park Gravel is considered to be perched, with true groundwater levels within the underlying solid strata.

8.20 Perched groundwater typically does not extend over large areas and is not indicative of the true water table level. BH02 terminated at 10m bgl within the London Clay and did not encounter further lenses of saturated deposits, so it is assumed the true water table level, and the groundwater body lies below the end of the drilled boreholes.

8.21 The true water table is not close to the surface and is located at depths greater than 10.00 m bgl. This is because of the presence of impermeable London Clay Formation from 5.00 m bgl preventing groundwater from rising.

8.22 The borehole and groundwater readings were taken in September. It is typical for groundwater to be highest in the winter season. That said, nearly all the groundwater indicator sites within the Thames catchment area were recorded for July[18] as being higher than normal levels. This means the groundwater position from the site investigation may be showing a level higher than typically seen at this time of year. For perched water, this means it may be present rather than have dried out during a dry and hot summer.

[16] Metis Consultants, March 2021, Further Groundwater Investigations for LBR
[17] Metris Consultants, March 2021, LBR Strategic Flood Risk Assessment
[18] https://www.gov.uk/government/publications/water-situation-local-area-reports/thames-water-situation-report-june-2024-summary

8.23 The onsite ground investigation was undertaken within a proceeding month which had rainfall totals which were deemed as slightly below the typical average of rainfall[19] (73% of average for August) for most areas in England. For July 2024, the rainfall record was substantially more wet than normal with a rainfall total of 165% of the long-term average[20] (1991 to 2020). This means the record from the site is reflective of the typical levels or are slightly elevated for this time of year.

8.24 In flood risk terms, perched water does have the ability to fluctuate with seasonal variations and rainfall events. It can dry out during hot and dry summer months and appear after rainfall events. As the perched groundwater was present in September after a wet summer, it is likely that the perched groundwater will also be present during the winter months too.

8.25 The proposed development involves implementing a basement FFL at 3.00 m below the ground floor level. With an allowance of 800mm for basement slab, waterproofing and insulation, basement formation level will be at approximately 8.80m AOD.

8.26 It is therefore recommended that the proposed basement is tanked or suitably waterproofed to prevent ingress from the identified perched groundwater and that the excavations suitably dewatered during the construction phase.

8.27 A sub-ground drainage system with sump pump is also proposed to further protect the new basement.

8.28 The risk of groundwater flooding affecting the basement is considered low with the proposed above mitigation measures which will act to manage and reduce this risk to a point where the development will be able to operate safely over the course of its lifetime.

Groundwater Flow

8.29 Groundwater flow will generally follow the topography of the local area. The topography in the vicinity of the Site reduces in elevation by approximately one metre over a distance of 550 m, south towards the River Thames. Groundwater flow across the Site will therefore be from north to south, as detailed in Figure 8.1, below.

8.30 The geotechnical laboratory test results detail the Kempton Park Gravel as principally comprising gravel and sand and to be highly permeable with an approximate porosity 30% to 40%.

8.31 Notwithstanding the high porosity soils, based on the local topography, groundwater flow rates across the Site are anticipated to be low.

[19] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcpsrrk8m
[20] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-and-regional-series

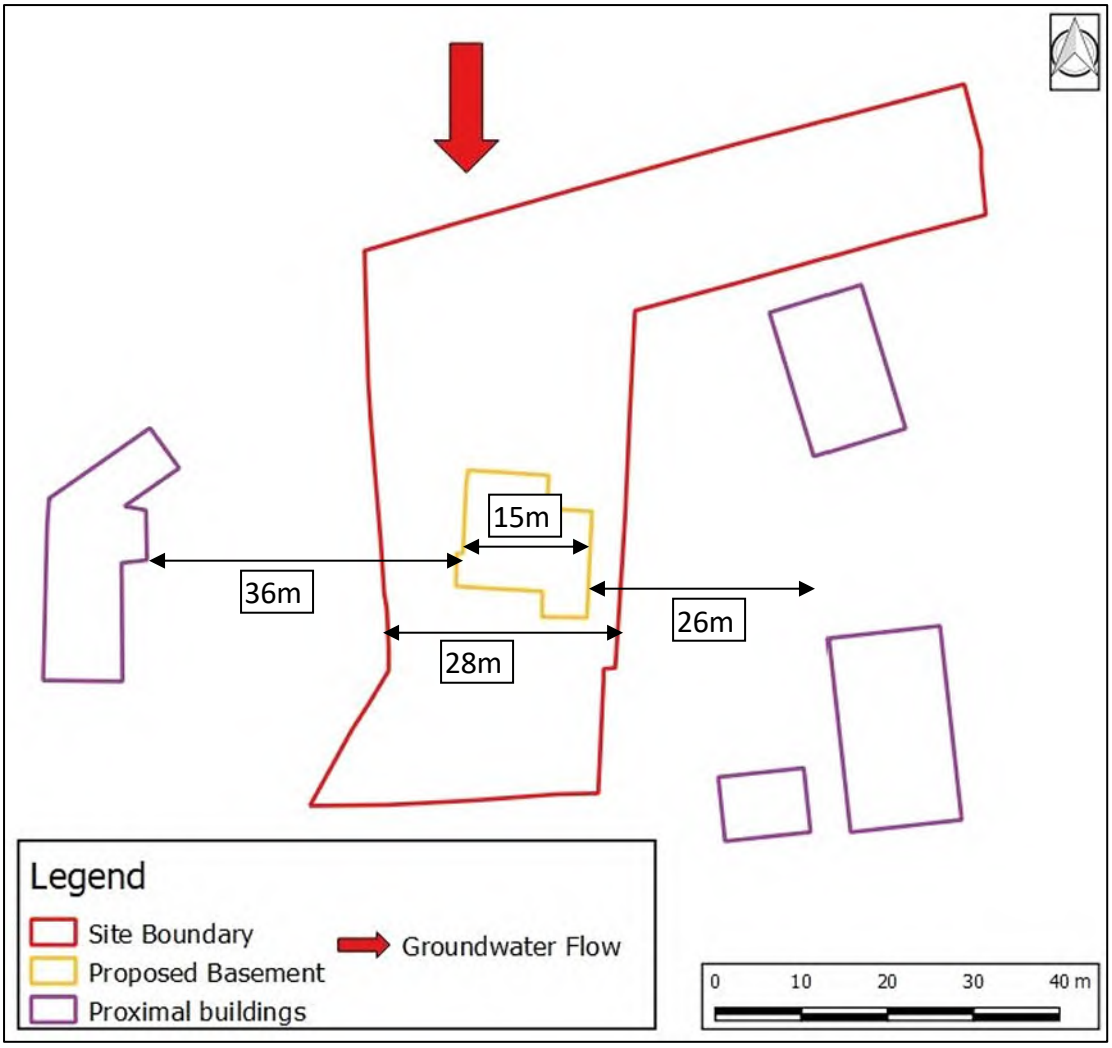


Figure 8.1: Groundwater Flow

8.32 Site groundwater levels are approximately 1.80 m bgl, with the base of the Kempton Park Gravels at 4.80 m bgl. The proposed basement formation level is indicated at 3.80 m bgl, penetrating 2.0 m within the groundwater table, as detailed within Figure 8.2, below.

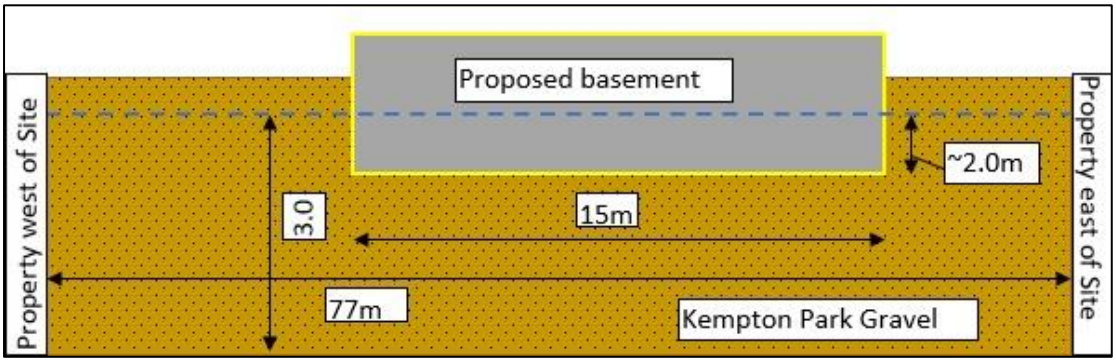


Figure 8.2: Groundwater Regime

8.33 The closest property west of the Site is 36 m away and the closest property east of the Site is at 26 m away. The proposed basement is 15 m wide, as detailed in Figure 8.1 and 8.2, above.

8.34 Therefore, taking a cross-section between the two proximal properties and the depth of groundwater within the Kempton Park Gravel (77.0m x 3.0m), the basement (15 m wide by 2.0 m within the groundwater table) will present a 13% obstruction to groundwater flow relative to the adjacent properties.

8.35 With a low flow rate across the Site, the high permeability of the Kempton Park gravel and the relatively low obstruction presented by the basement within the groundwater table, the proposed basement will not increase throughflow or groundwater risk by means of flow diversion to the proximal properties.

Flood Risk from Artificial Water bodies

8.36 There is one artificial water body within 1 km of the site, this is a settlement pond associated with TW Hampton water treatment works. The pond contains wastewater undergoing treatment and as such is unlikely to be hydrologically linked to the site or the surrounding area.

8.37 The EA Long Term Flood Risk from artificial sources map shows that the area surrounding the site would not be affected by reservoir flooding in the event of a nearby reservoir failure[21] (Figure 4.7).

8.38 The site is therefore not considered at risk of reservoir flooding and there are no further artificial waterbodies in the area that would constitute a significant risk of flooding to the site.

8.39 There are no other sources of flooding that present a risk to the site.

Flood Risk from Public Sewers

8.40 Sewer flooding is due to the overloading of sewer capacity during a storm event and most commonly results in localised short-term flooding. Surcharge of adopted sewers into properties is also a risk due to blockage or misuse of the drainage system over time. Flooding from sewers and highways is linked to the risk of flooding from surface water in urban areas, with the exact source of flooding often indistinguishable.

8.41 A plan showing the location of Thames Water sewer assets close to the site is provided in Appendix A. The plans show a separate foul and surface water sewer operated and maintained by Thames Water running within High Street.

8.42 The Thames Water sewers run north to south, a connection is not shown to the proposed development site, but it is assumed a connection exists to the existing dwelling. A small

[21] Environment Agency., 2024. *Risk of Flooding from Reservoirs* - Maximum Flood Extent (Web Mapping Service). [Online]. Available at: https://data.gov.uk/dataset/44b9df6e-c1d4-40e9-98eb-bb3698ecb076/risk-of-flooding-from-reservoirs-maximum-flood-extent-web-mapping-service [Accessed November, 2024].

number of surface water sewers are also shown on the map provided, serving one or two properties before connecting to the foul sewer shown within High Street.

8.43 Thames Water were contacted for information regarding sewer flooding at the site and their records indicate that there have been no incidents of flooding at the site as a result of surcharging public sewers. A copy of this correspondence is provided in Appendix A.

8.44 As mentioned previously in the preceding Historical Records of flooding section. The Richmond SFRA includes an interactive map of Thames Water recorded flooding incidences, taken from the DG5 register, which indicates that there have been up to three incidences of sewer flooding recorded within the area containing the site.

8.45 The basement extension will include a sump pump arrangement as outlined in the LBR Good Practice Guide for Basements[22]. These devices are to be fitted on the foul and surface water outlets to reduce the risk of internal sewer flooding from surcharging sewers which could be serving the property position.

8.46 If surcharging sewers occurred, the mitigation measures proposed to manage potential flooding from surface water and breach flood risk should be sufficient to protect the development. At a minimum, the finished floor levels or threshold level should be set 75-150 mm above the surrounding ground levels in accordance with CIRIA Designing for Urban Exceedance. This is to provide from freeboard from any standing water.

8.47 The risk of sewer flooding is therefore considered to be low with the proposed mitigation measures. Sewer flooding from blockage of private site and building drainage as well as the TW network is, however, a residual risk managed by the design of the Site drainage and regular inspection and maintenance of the public and private sewer network.

Flood Risk from Water Mains

8.48 Flood risk from this source is considered to be a residual risk with no existing mains shown within the supplied TW asset plans (Appendix A) crossing the site. The main threat therefore will be from damage to newly constructed internal pipe work during the construction phase or as a result of any future building works.

8.49 TW is also the potable water supplier for the area, asset plans contained within Appendix A, indicate that water supply assets are generally located within the service corridors of the roads in close proximity to the Site, including High Street.

8.50 Mitigation measures put in place to manage flood water from the above surface water and groundwater risks should be sufficient to also manage any flood flows from this source.

[22] London Borough of Richmond upon Thames, May 2015, Planning Advice Note, Good Practice Guide on Basement Developments

However, this source of flooding is deemed a residual risk and should not cause flooding under normal operating conditions.

Historical Records of Flooding

8.51 A number of sources of flood risk were investigated to determine if the site or surrounding area have been affected by floods in the past.

8.52 It has been found that the EA does not hold any records of flooding at the site.

8.53 The area to the east of High Street, approximately 35 m from the site entrance is however shown to have flooded during the winter of 2013 / 14, New year / January 2003, and December / Winter 2000[23].

8.54 The Richmond SFRA includes an interactive map of Thames Water recorded flooding incidences which shows the site to lie in an area showing up to ten incidents of sewers surcharging. This corresponds with the SWMP showing three internal incidents and zero external incidents of sewer flooding were recorded within the TW12 2 postcode.

8.55 The Richmond PFRA has recorded no instances of surface water flooding at the site or within the surrounding area.

8.56 The PFRA also contains mapping showing records of past flooding. Figure 2 - Increased potential for Elevated Groundwater, shows a groundwater flood incident recorded in an area nearby to the site. There is no evidence of this event affecting the site.

8.57 A Sewer Flooding History search was also obtained from TW which holds no records of flooding for the extent shown within the asset plan mapping provided (Appendix A).

8.58 No other historical records of flooding to the site have been identified.

Flood Risk Summary

5.1 In summary, the Site is at risk of flooding from surface water and groundwater sources, however, several mitigation measures are recommended within this chapter to address and manage the residual risks from these forms of flooding to ensure the proposed scheme is safe from flooding.

[23] EA Recorded Flood Outlines https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590 Retrieved 29th August 2024

Design Response to Flood risk

8.59 The above Flood Risk Assessment has found that the site is at potential risk of surface water flooding at the site. However, the proposed location of the replacement dwelling is not at risk of surface water flooding due to its elevated position above the low points on the site which are shown not to collect surface water.

8.60 In accordance with CIRIA Designing for Urban Exceedance, finished floor level or threshold levels should be set 75-150 mm above the surrounding ground levels to allow for some resilience to prevent any unforeseen flooding from entering the property.

8.61 The proposed development is considered to be at low risk of surface water flooding with the proposed mitigation measures.

8.62 As the proposed development includes a basement, a non-return valve or positive pumped foul sewerage system is recommended, as outlined in the LBR Good Basement Guide.

8.63 In addition, tanking or waterproofing the basement will prevent any groundwater seepage from causing dampness at the property.

8.64 Construction of the basement must take into account the groundwater at the Site, with some form of temporary works employed to restrict groundwater flow into the basement excavation. Without the temporary, an expensive groundwater pumping regime will be required to facilitate basement construction

9.0 SuDS ASSESSMENT

Planning policy

National Planning Policy Framework

9.1 The revised National Planning Policy Framework (NPPF) was updated December 2023 and sets out the Governments' planning policies for England and how these are expected to be applied. In terms of flooding, the NPPF states that run-off rates and volumes should not increase from any site following development, to prevent an increase in surface water flood risk elsewhere.

9.2 The NPPF and Planning Practice Guidance requires that sustainable drainage systems should be considered and included where practicable, in line with DEFRA Non-Statutory Technical Standards[24].

The London Plan

9.3 Policy SI 12; Sustainable Drainage states that:

"Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features/ in line with the following drainage hierarchy:

1) *rainwater use as a resource (for example rainwater harvesting/ blue roofs for irrigation)*
2) *rainwater infiltration to ground at or close to source*
3) *rainwater attenuation in green infrastructure features for gradual release (for example green roofs/ rain gardens)*
4) *rainwater discharge direct to a watercourse (unless not appropriate)*
5) *controlled rainwater discharge to a surface water sewer or drain*
6) *controlled rainwater discharge to a combined sewer."*

9.4 Policy SI 13 also requires that "*impermeable surfacing should normally be resisted unless they can be shown to be unavoidable/ including on small surfaces such as front gardens and driveways*." In addition, "*drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening/ amenity and recreation*'.

[24] Department for Environment and Rural Affairs (DEFRA)., 2015. *Sustainable drainage systems: non-statutory technical standards.* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf [Accessed November, 2024].

Local Plan - London Borough of Richmond

9.5 LBR adopted the Local Plan[25] in July 2018 which sets out policies and guidance for the development of the Borough. The Local Plan supersedes the Core Strategy adopted in April 2009 and the Development Management Plan adopted in November 2011. The Local Plan Strategic Vision emphasises that *"The Council will have played its part in minimising vulnerability of people and property to a changing climate change/ including mitigating and adapting to the effects of climate change and supporting the move towards zero carbon."*

9.6 LBR are currently in the process of preparing a new Local Plan for Richmond borough. This is not expected to be adopted until Winter 2024.

9.7 The Local Plan places a focus on spatial planning for a sustainable future and one of the strategic objectives of the Borough is to:

"*Promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property; this includes by risk of flooding/ water shortages/ subsidence and the effects of overheating.* "

9.8 Policy LP 21 'Flood Risk and Sustainable Drainage' of the Local Plan states that:

''All developments should avoid, or minimise/ contributing to all sources of flooding/ including fluvial, tidal, surface water, groundwater and flooding from sewers/ taking account of climate change and without increasing flood risk elsewhere. "

9.9 Regarding sustainable drainage, Policy LP 21 indicates that

" *The Council will require the use of Sustainable Drainage Systems (SuDS) in all development proposals*."

In particular,

"*applicants will need to demonstrate that their proposals comply with a reduction to greenfield runoff rates wherever feasible. If not the minimum requirement is to achieve at least a 50% attenuation of the site's surface water runoff at peak times based on the levels existing prior to the development*. "

9.10 Additionally, the LBR has produced a Planning Guidance Document related to SuDS[26] in February 2015 which includes advice on how to incorporate SuDS in a range of developments.

[25] London Borough of Richmond upon Thames, Local Plan, July 2018

[26] London Borough of Richmond upon Thames, Planning Guidance Document - Delivering SuDS in Richmond, February 2015

Site Runoff Characteristics

9.11 Detailed runoff calculations have been undertaken for the Site in its existing and post-development state.

9.12 The development has an approximate total impermeable area of 0.06 ha. The greenfield runoff rates have been calculated via the FEH statistical method available as an online tool hosted by the H. R. Wallingford UK suds website[27] and are summarised in Table 9.1 below. This tool unfortunately limits the minimum site area calculable to 0.10 ha which has been used to estimate as near as possible the expected run-off rate from the proposed impermeable areas of the site.

9.13 The current brownfield rate for the existing building (0.02 ha) and equivalent greenfield rate for the whole Site (red line boundary, 0.27 ha) has also been calculated and is also summarised in Table 9.1 below.

Table 9.1: Proposed Site Runoff Rate

Rainfall Event	Whole Site Greenfield Runoff Rate (l/s, 0.27 ha)	Brownfield runoff rate existing house footprint	Roof 1: Greenfield Runoff Rate (l/s, 0.1ha)
Q 1 year	0.25	2.33	0.09
Q 30 year	0.68	5.71	0.25
Q 100 year	0.94	7.37	0.35

9.14 An allowance for climate change must be included within all SuDS strategies within the rainfall parameter. Climate change allowances for rainfall is based on the catchment the site is based within and the proposed lifespan for the development. The Site is within the Maidenhead & Sunbury Management Catchment and residential is deemed to have a 100 year lifetime.

9.15 The climate change allowance for the Site is 40% for the “Upper End” allowance in the 2070’s epoch. The design event is 1% AEP plus 40% CC for any proposed SuDS network.

9.16 The proposed development will include a new 3 story building of approximately 0.043 ha in size. This area has been utilised within the following drainage calculations. There are also areas of landscaping surrounding the proposed building which will comprise currently existing gardens, mature trees and a tarmac driveway (to remain unaltered).

9.17 The proposals do not include any basement footprint which extends beyond the footprint of the upper levels and will not therefore include any buried layers which may impede infiltration if and when it occurs.

[27] H. R. Wallingford., 2024. *UK SuDS online greenfield run-off rate estimation tool.* [Online]. Available at: https://www.uksuds.com/tools/members/greenfield-runoff-rate-estimation-members [Accessed November, 2024].

SuDS Drainage Principles

9.18 The aim of SuDS is to mimic the natural drainage process and reduce the impact of urbanisation on the frequency and size of floods. SuDS should also protect and enhance the environment.

Drainage Discharge Hierarchy

9.19 The discharge hierarchy should be considered and the relevant Planning Practice Guidance states:

> *"Generally the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:*
>
> *1. Into the ground (infiltration);*
> *2. To a surface water body;*
> *3. To a surface water sewer, highway drain or another drainage system;*
> *4. To a combined sewer."*

9.20 The proposed drainage strategy should preferentially discharge water falling on paved areas to the ground via formal soakaways or shallow infiltration (subject to testing) and design constraints.

9.21 However, formal point source infiltration methods such as soakaways are not considered suitable at the Site due to the presence of perched groundwater and impermeable London Clay at the site. It is a requirement of CIRIA guidelines that a 1 m unsaturated zone is present below any infiltrating feature, to maintain sufficient infiltration rates.

9.22 Shallow infiltration features such as permeable pavements with a gravel sub-base and porous membrane, may be considered suitable if lined. However, fully infiltering measures may not be compatible due to the perched groundwater at the site.

9.23 There are no open surface water bodies adjacent to the site which can be utilised to discharge surface water.

9.24 The adopted Thames Water surface water sewer network is located within the vicinity of the Site, as described above. It is assumed the current Site is connected to the adopted sewer network.

SuDS Drainage Principles

9.25 The SuDS hierarchy shown in Table 9.2 provides guidance on the how to manage surface water with the most sustainable being chosen first for implementation. The table also notes which

SuDS devices are practicable and proposed to be included within the development. There should be a preference for green over grey features, in line with the SuDS hierarchy.

Table 9.2: SuDS Techniques and Application to the Development

	SuDS Techniques	Practicable	Proposed	Notes
Most Sustainable	Green Roof	Y	Y	Suitable and being proposed. Provides amenity and biodiversity benefits
	Basins and Ponds -Constructed wetlands -Balancing ponds -Detention basins -Retention ponds	N	N	Not suitable on the site due to limited open space and root protection zones with the development.
	Filter Strips and Swales	N	N	Not suitable on the site due to space requirements for these SuDS features.
	Infiltration Devices -Soakaways -Infiltration trenches and basins	N	N	The provision of soakaways would not be able to be constructed due to depth to perched groundwater limiting the unsaturated zone
	Permeable Surfaces -Gravelled areas -Permeable pavers	Y	Y	Should be included, where possible in line with London Plan.
Least Sustainable	Tanks Systems -Oversized pipes -Crated storage	Y	Y	Storage could be provided with discharge to the surface water sewer limited to the lowest possible rate.

9.26 Following the SuDS hierarchy, a green roof is suitable for the development due to the inclusion of flat roofs. Green roofs are compatible with photovoltaics (PV) because the micro-climate from the green roof provides a more constant temperature during the year. The cooling effect in the summer and warming in the winter, allows the PV to operate more efficiently.

9.27 Basins, ponds, filter strips, and swales as SuDS elements are not suitable for use within the development due to a lack of available space and the presence of a number of overlapping root protection zones, for these larger above ground SuDS features to attenuate surface water.

9.28 To provide additional source control and retain rainwater on Site for potential reuse, it is strongly recommended that any landscaped areas are designed as bioretention areas, tree pits and/or rain gardens to retain and utilise rainfall. Water butts or down pipes to rain gardens should also be installed on rainwater downpipes, if possible. With suitable

landscaping and levels, rainwater/surface water could also be directed into tree pits and landscaped areas to self-irrigate.

9.29 The proposed outlined SuDS strategy has been determined following the drainage and SuDS hierarchy which helps to ensure surface water is managed as close to its source as possible. There should be a preference for green over grey features, in line with the SuDS hierarchy shown above.

Proposed SuDS for the Development

9.30 As per the requirements of local policy, new developments are required to reduce surface water runoff post-development.

9.31 The proposed development will increase the impermeable area on the site and therefore increase surface water rates off the Site post development. A flow control will therefore be required to limit the outflows from the site post development to those expected for a greenfield site including an allowance for climate change.

9.32 Analysis has been undertaken to propose an outline SuDS strategy, in accordance with sustainable drainage principles, which limits the surface water runoff from the proposed development and includes climate change.

9.33 The FLOW calculations have used some conservative design decisions. These include:

- Volumetric runoff coefficient (Cv) values were changed from the default (Cv=0.74 and 0.84) to ensure that all of the design storm events were captured in the drainage model the default Cv values assume loss of water through natural infiltration etc. A Cv value of 1.0 ensures all of the storm water is assessed i.e. 100% of the water is modelled.
- Reducing the additional storage (m^3/ha) value of 20 within Flow to 0 within the simulation settings. This has been undertaken as the default settings assume that 20m^3 is lost or stored in peripheral storage in the drainage system between hitting the ground and reaching the drainage network. Reducing this to 0 allows all water hitting the development to be attenuated to reflect a worst-case scenario.
- FEH 22 (Flood Estimation Handbook 2022) point data was also used for the storm event rather than FSR (Flood Studies Report). FEH is more up to date than FSR data and provides a better representation of an actual events.
- The collection of rainwater into water butts or water reuse were excluded from the outline calculations because these could be full at the time of a storm event. The additional storage available within any proposed water butts or water reuse system can provide additional storage for exceedance events.
- Product specifications for the ACO standard geo-cellular attenuation crates have been incorporated within the calculations. This includes the crates having a porosity of 97% and depth of 0.914 m.

9.34 There are a series of design constraints on the location of SuDS due to Root Protection Zones (RPZ) and utilities which run across the site. This limits the location of a SuDS on the site.

9.35 Given the space constraints of the Site, green roofs with an attenuation tank beneath the garden area is the most feasible SuDS strategy for the proposed development.

9.36 The outline proposals restrict surface water flow rates to 1.0 l/s (Appendix H) and have been shown to collectively control surface water up to the 100 year plus 40% climate change event without flooding. The proposed SuDS measures include:

- Green roof – spanning the rooftop areas of the building (ground and 1st floor level), an area of 207.6 m^2 (inclusive of any photovoltaic panels), designed to include 300 mm substate for water quality treatment purposes.
- Tanked permeable paving to sunken courtyard area (58.4 m^2)
- Fin drain and positive pump collecting flows from sunken courtyard area (58.4 m^2)
- ACO Stormbrixx - depth of 0.914 m positioned under the terrace, covering an area of 48.24 m^2.
- Flow Control restricting flows to 1.0 l/s for all rainfall events, up to and including the 1 in 100 year plus 40% event (Appendix H).

9.37 The preliminary calculation for the proposed SuDS features to control surface water on the Site for the development are included in Appendix I and an indicative Surface Water Drainage Strategy drawing is included in this report.

9.38 It is proposed to discharge to the TW surface water sewer within High Street, via an assumed existing connection. TW are to be contacted as part of the detailed design phase to confirm the re-use of the existing connection is acceptable. To confirm these assumptions, a CCTV inspection will also be required as part of the detailed design.

9.39 It should be noted that the proposed discharge rate of 1.0 l/s is the lowest the proposed SuDS design can achieve due to the technical specification of the flow control.

9.40 Policy SI 13 states that development proposals should aim to achieve greenfield runoff rate. This is 0.09 l/s in the 100-year event. Attenuating to such a small greenfield runoff rate would require disproportionately large storage to be installed when compared to the size of the proposed development. Reducing runoff rates to this level is also not deemed practicable since this would result in a drainage network that would not have sufficient flow rate velocities to ensure self-cleansing. Equally, having a flow rate with less than the self-cleansing velocity increases the risk of sewer flooding through the increased chance of blockage due to the small pipework.

9.41 To reduce the risk of sewer surcharge into the proposed basement a non-return valve must be included upstream of the foul connection point to protect the basement from any surcharged sewage.

9.42 Detail design of the green roof, attenuation tanks, pipe runs, and the connections are considered part of the detailed design stage of the development. This level of detail can be conditioned as part of the planning permission, if required.

9.43 The design of the SuDS network has been specified to ensure appropriate attenuation upstream of the outfall to the TW surface sewer.

9.44 The inclusion of SuDS would not increase the risk of surface water flooding but result in reduced peak flow rates from the Site. The development would not result in the exacerbation of the current situation.

9.45 The development will act to reduce the peak loadings to the local public sewer network, via attenuation, potentially reducing the risk of sewer flooding to neighbouring properties.

9.46 The proposed development has been shown it can incorporate SuDS to ensure there will not be an increase current surface water runoff rates from the Site post-development.

Surface Water Quality

9.47 Pollution control requirements are determined by the using the Simple Index Approach as detailed in the CIRIA SuDS Manual. The pollution indices for this Site as per Table 26.2 of the CIRIA SuDS Manual can be seen below:

Table 9.3: Calculated SuDS pollution mitigation indexes for the Site

Land Use	Total Suspended Solids	Metals	Hydrocarbons
Residential roofs	0.20	0.20	0.05

9.48 Surface water from the proposed roof areas will be treated via filtration through the green roofing substrate prior to discharge offsite, whereas the sunken courtyard area will drain via tanked permeable paving. Based on table 26.3 and 26.4 from the CIRIA SuDS Manual, this will provide treatment indices of:

Table 9.4: Indicative SuDS mitigation indices

SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
A soil with good contaminant attenuation potential of at least 300 mm in depth	0.4	0.3	0.3
Permeable Paving	0.7	0.6	0.7

9.49 It can be seen from the tables above that the proposed treatment provides the required level of treatment for this Site prior to discharge.

Exceedance Flow Routes

9.50 The precautionary assumptions and decisions used (i.e. no water butts or rainwater harvesting although proposed) within the SuDS calculations ensure there is adequate space in the network for the design storm event. This means there should be additional storage available within the proposed SuDS network for exceedance events.

9.51 For exceedance events, the surface water flows would flow into surrounding garden areas where it will be allowed to pond and infiltrate or follow the local topography. This would be towards the northern area of the site surrounding the driveway. Exceedance flow routes are shown on Drawing 3285_CCE_XX_ZZ_DR_D_001.

9.52 The development has considered exceedance event in the Site and development layout as with the following principles:

- External ground levels will be profiled such that no ponding occurs against buildings,
- All flows in excess of the drainage network design standard will be channelled towards the surrounding garden areas as shown on Drawing 3285_CCE_XX_ZZ_DR_D_001.

Management and Maintenance of the Proposed SuDS

9.53 The SuDS Manual provides some outline guidance on maintenance requirements. These are generic and provide advice only. Management and maintenance of all drainage elements should be carried out in accordance with the guidance and specification provided by the relevant suppliers.

9.54 The flow control and pump management and maintenance will be specified by the manufacturer.

9.55 The freeholder will be responsible for the upkeep and management of the SuDS network. This can be subcontracted to a specialist company, if required.

Table 9.5: Maintenance requirements for attenuation storage tank[28]

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly

[28] Based on CIRIA C753 Table 21.3 - Operation and maintenance requirements for attenuation storage tanks

	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 9.6: Maintenance requirements for Green Roofs[29]

Maintenance schedule	Required action	Typical frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	
	Inspect underside of roof for evidence of leakage	
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and	As required

[29] Based on CIRIA C753

	sources of erosion damage should be identified and controlled	
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	

Table 9.7: Maintenance requirements for Tanked Permeable Paving[30]

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations–pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent communal areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required / once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth–if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	

[30] Based on CIRIA C753

SuDS Summary

9.56 Following development, the surface water drainage strategy set out above ensures that sufficient storage within the sustainable drainage systems will be included to make sure that there is no increase in the surface water runoff from the Site compared to the existing situation (for all rainfall events up to the 1 in 100 year rainfall event including an allowance for climate change). The inclusion of SuDS would not increase the risk of surface water flooding but result in fewer overland flow routes from the Site.

9.57 For all events beyond the 1 in 100 year plus climate change rainfall event, the situation will be no worse than existing, as long as a consideration of exceedance flows is made as part of the detailed drainage design to ensure that any excess surface water runoff would continue to overflow away from the existing and proposed residential properties.

9.58 The proposed SuDS measures for the development have been demonstrated to result in a reduction in surface water runoff rates from the Site post-development and the proposals attempt to limit runoff, in so far as technically practicable, towards greenfield rates. This is compliance with the NPPF, London Plan, and local policy.

9.59 The development proposed a green roof with below ground attenuation to reduce runoff rates to 1 l/s. This is the lowest possible flow rate within a drainage network to ensure self-cleansing velocities and compliant with Thames Water for new developments.

9.60 The LBR SuDS Pro-Forma is presented within Appendix J.

9.61 The inclusion of SuDS reduces flood risk to other areas and properties by attenuating surface water on the Site and using a controlled discharge compared to the uncontrolled discharge on site.

9.62 The proposed drainage strategy will therefore reduce the peak load to the local public sewer network, reducing the risk of sewer flooding to neighbouring properties.

10.0 BASEMENT IMPACT ASSESSMENT – FLOOD RISK & DRAINAGE

10.1 The FRA has determined that the Site is at risk of surface water flooding, but the location of the proposed development is not shown to be at risk of flooding in the mapping. However, in accordance with CIRIA Designing for Urban Exceedance, finished floor level or threshold levels should be set 75-150 mm above the surrounding ground levels to allow for some resilience to any unforeseen flooding from surface water flooding.

10.2 It has been determined that the construction of the proposed basement will be undertaken within a permeable geological stratum that is classified as an aquifer. The onsite ground investigation has determined water was discovered but is deemed to be a perched water, as it is underlain with impermeable clay to end of the borehole logs at 10.00 m bgl. The true water table would be below the impermeable clay layer.

10.3 The development will interact with the identified perched water however, this is constrained in throughflow by surrounding confining geology and as such is not expected to increase flood risk, either during construction or following completion of the proposed basement. The current dwelling foundations already interact with the perched water, and the proposed development should not alter the situation at the site.

10.4 As perched groundwater was discovered close to the surface, it has been recommended that the proposed development follows the CIRIA Designing for Urban Exceedance to prevent the ingress of any water to the development from the perched water emerging at the surface.

10.5 The basement will not affect the risk of groundwater flooding to third parties, as it is not located within the true groundwater body / water table. This is assuming all mitigation measures proposed are included within the final design and is appropriately constructed and managed alongside the development.

10.6 The BIA has concluded there is low risk of flooding from any source affecting the site with the implementation of the proposed mitigation measures.

10.7 The implementation of SuDS in the form of a green roof and below ground attenuation tank will ensure that the runoff rates from the site can be reduced to 1.0 l/s in the design flood event.

10.8 The BIA has concluded there are no likely impacts on the wider hydrological environment as a result of the proposed development.

10.9 The LBR Verification Form is included within Appendix J.

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 This report has covered the Basement Screening Questions outlined in the LBR SFRA and LBR Basement Assessment User Guide in relation to flood risk and drainage. The answers to the Basement Screening Questions resulted in a BIA being undertaken in relation to potential surface water flooding at the site, permeable geology and the potential for below ground water interacting with the basement extension, and the management of surface water runoff due to an increase in impermeable areas post development.

11.2 The initial desk study for the LBR Basement Screening Questions reviewed the risk of flooding from all sources. The assessment found that the site is located within Flood Zone 1, hence not at risk of tidal or fluvial flooding stemming from the River Thames. The site is not at risk of flooding from the Longford River to the east.

11.3 The site was shown to be at potential risk of flooding from surface water, and this source of flooding was investigated further within the BIA. Isolated surface water ponding was shown to affect the existing access road during extreme rainfall events, but the location of the current and proposed house is shown to not be at risk. Mitigation measures of raised threshold or finished floor levels in line with CIRIA Designing for Urban Exceedance have therefore been proposed to prevent the ingress of any unforeseen surface water into the development.

11.4 The site is located within permeable geology; Kempton Park Gravel Member confirmed by a Site specific ground investigation. The Kempton Park Gravel Member is capable of supporting below ground water. The ground investigation which took place in September 2024 and found perched groundwater between 2.0m to 4.0m bgl during the borehole drilling. Subsequent monitoring over a six week period recorded groundwater at levels of between 1.62m and 2.08m bgl. This was in permeable geology which was underlain by the impermeable London Clay. No evidence of the true water table was found in the subsequent dry clay strata to 10 m bgl.

11.5 With a low flow groundwater rate across the Site, the high permeability of the Kempton Park gravel and the relatively low obstruction presented by the basement within the groundwater table, the proposed basement will not increase throughflow or groundwater risk by means of flow diversion to the proximal properties.

11.6 It is recommended that the proposed basement is tanked or suitably waterproofed to prevent interaction with the identified perched water. A sub-ground drainage system with sump pump is also proposed to further protect the new basement from the possibility of a surcharged sewer.

11.7 The ground movement assessment concluded proximal properties would be subject to negligible damage from the proposed basement construction and the removal of 3No. low water demand trees as part of the proposed development would not result in ground heave impacting upon the proposed development or proximal properties.

11.8 It is recommended the method of basement construction takes into account the groundwater at the Site, with some form of temporary works employed to restrict groundwater flow into the basement excavation. Without the temporary, an expensive groundwater pumping regime will be required to facilitate basement construction.

11.9 The BIA also highlighted the requirement of SuDS to ensure no increase in surface water runoff post development, including allowing for future climate change over the development lifetime. The outline SuDS strategy presented in this report indicates that runoff from the site can be reduced to a peak rate of 1.0 l/s for the 100-year event plus 40% climate change. To achieve this, a SuDS network of green roofs, permeable paving, and attenuation tanks provides suitable storage with flow control. This ensures that there is a reduction in runoff from the site compared to the existing development.

11.10 SuDS specific management and maintenance plans will be determined at detailed design and are the responsibility of the homeowner. General rules on management and maintenance have been provided in this report.

11.11 The proposed development will therefore not increase surface water runoff rates and volumes from the site post-development and attempts to limit runoff, in so far as technically practicable, towards greenfield rates. This is compliant with the NPPF, the London Plan and local policy.