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

EXECUTIVE SUMMARY

The site assessed in this report is located at the property known as Sevenoaks located at 101 A High Street, Hampton 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 m below the proposed ground floor level to approximately 9.60 m 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) was required to be undertaken including an assessment of geology and hydrogeology. This was to ensure the "Subterranean Characteristics" and "Flood Risk and Drainage" questions could be answered accurately.

The FRA 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).

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 Southeastern Drilling Services Ltd in September 2024. The two on-site boreholes were drilled to depths of 6 m (BH1) and 10 m (BH2) 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 indicated that the water recorded is a perched water table, which can’t infiltrate past the impermeable 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 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.

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 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

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 2SL, 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' and 'Flood Risk and Drainage' elements of the basement screening assessment and 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 Whilst this report does include consideration of geology, below ground flows, and flood risk as part of the overall assessment of flood risk, the 'Land Stability' sections of the BIA should be completed by a suitably qualified engineer who specializes in this area.

1.8 The study includes a Flood Risk Assessment (FRA) and Sustainable Drainage Systems (SuDS) Assessment as part of the report. The scope of the FRA 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).

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

- To assess the risk and implications of flooding on the site including flooding from tidal, fluvial, groundwater, surface water runoff, and artificial sources.
- 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.

2.0 SITE DESCRIPTION

Location

2.1 The site is situated at Sevenoaks, 101 A High Street, in Hampton, this can be seen in Figure 1.1. High Street is situated to the north of Upper Sunbury Road / A308.

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 - SUBTERRANEAN CHARACTERISTICS, FLOOD RISK AND DRAINAGE

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].

Geology

4.3 The online 1:50 k British Geology Society (BGS) map indicates that the site is underlain by superficial deposits of Kempton Park Gravel Member - sand and gravel. Beneath the Kempton Park Gravel Member is the London Clay Formation. The London Clay Formation is made up of clay and silt and is largely impermeable. The geology at the site can be seen in Figures 4.1 and 4.2.

4.4 A site ground investigation was undertaken on 3rd September 2024 by Southeastern Drilling Services Ltd which comprised two boreholes dug to 6.00 and 10.00 m bgl. The boreholes identified topsoil to 0.90 m bgl which is then underlain by brown sandy gravely clay between 1.7 - 2.3 m bgl, and then sands and gravels to 4.70 – 4.80 m and grey clay (London Clay) from 5.00 m bgl and beyond (to end of boreholes at 10 m bgl). The boreholes confirmed that the BGS mapping is reflective of the local area.

4.5 The borehole locations were taken at the front of the current dwelling. This was because access to the rear of the dwelling / back garden was not achievable due to access issues for the rig.

Hydrogeology

4.6 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

[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

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.

4.7 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.

4.8 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.

4.9 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.

4.10 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.

4.11 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.

4.12 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

4.13 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.

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

4.15 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].

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

4.16 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.

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

4.18 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.

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

Flooding from Rivers and Sea

4.20 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.

4.21 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.

4.22 Figure 4.3 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.

4.23 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.

Flooding from Surface Water

4.24 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.

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

4.25 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.

4.26 Figure 4.4 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.

4.27 Figure 4.4 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.

4.28 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].

4.29 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

4.30 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.

4.31 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.

4.32 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.

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

4.33 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.

4.34 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.

4.35 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.

Risk of Flooding from Groundwater

4.36 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'.

4.37 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.

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

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

Risk of Flooding from Other Sources

4.40 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 4.6).

4.41 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.

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

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

Climate Change

4.43 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

4.44 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

4.45 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.

4.46 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.

5.0 SCREENING ASSESSMENT - SUBTERRANEAN CHARACTERISTICS

5.1 From the initial data collection and ground investigation on the site (outlined in Chapter 4), the Subterranean Characteristics Screening Assessment can be undertaken.

Subterranean Characteristics

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

Answer: Yes

The onsite ground investigation identified a perched lens of water between 2.00 to 4.00 m bgl, no further saturated strata was identified beyond this to 10 m bgl (end of BH 2). The basement level will however interact with the perched groundwater.

An assessment of the flooding risks and potential mitigation measures is therefore 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 ground investigation shows the site to be underlain by the Kempton Park Gravel. Kempton Park Gravels 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: Yes

The onsite ground investigation identified a perched water between 2.00 to 4.00 m bgl. The construction of the basement level will interact with the perched water. Perched water is not the true water table, but an assessment of the flooding risks and potential mitigation measures is therefore 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 onsite ground investigation and published BGS maps show the site at the location of the proposed basement is positioned upon the Kempton Park Gravel Member superficial deposits which is known to be underlain by the London Clay Formation.

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

Answer: Yes

5.3 The onsite ground investigation and published BGS maps show the site to be located within the superficial Kempton Park Gravel Member, which is classified as a Principal Aquifer and known to lie over the London Clay.

6.0 SCREENING - FLOOD RISK AND DRAINAGE

6.1 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.

Flood Risk and Drainage

1) 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.

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

Answer: No

The onsite ground investigation identified saturated geology between 2.00 to 4.00 m bgl. The basement level will interact with the perched water. However, underlying geology was found to be dry, indicating this water belongs to a perched lens of groundwater and is not indicative of the true water table at the site.

Given that perched groundwater is typically isolated in nature and confined by surrounding impermeable layers of geology it is considered the basement development will not affect the flow profile of the true water table at or beyond the site. Moreover, the current house foundation already interacts with the perched water and the replacement dwelling should not dramatically alter the situation.

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.

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

Answer: No

The proposed basement is not located in the true water table, and therefore will not affect the groundwater through flow or affect neighbouring properties.

The current house foundation already interacts with the perched water and the replacement dwelling should not dramatically alter the situation in relation to the perched water.

7.0 SCREENING ASSESSMENT SUMMARY

7.1 The Screening Assessment involved answering the screening questions including presenting supporting evidence (contained within Chapters 2 to 4 which references the Appendices as appropriate) to justify the response.

7.2 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.

7.3 The following matters have been highlighted as areas to be brought forward for further investigation because of a positive answer to the Screening Assessment questions, set by LBR.

Subterranean Characteristics

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

- The site is underlain by the Kempton Park Gravel Member which is classed as a principle superficial aquifer
- The site is located within an area with perched below ground water.
- The site is underlain by a principal superficial deposit aquifer

Flood Risk and Drainage

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

- The site is at potential risk of flooding from surface water during intense rainfall on the site, but the development is located outside the shown risk floodplain.
- Potential change in runoff rates due to an increase in the proportion of hard paved surfaces on the site. This requires a SuDS strategy to ensure there is no impact on downstream runoff flows or water quality.
- Potential changes in runoff due to climate change over the lifetime of the development. This requires a SuDS strategy to ensure there is no impact on downstream runoff flows or water quality.
- There is potential for the basement to interact with perched water due to saturated geology being identified above the proposed FFL of the basement.

8.0 SCOPING

8.1 The following issues have been brought forward from the Screening Assessment for further assessment within the BIA:

- Risk of flooding from surface water,
- Risk of flooding from groundwater and risk to the aquifer from the proposed development,
- Potential change in runoff rates due to an increase in the proportion of hard paved surfaces on the site; and
- Potential changes in runoff due to climate change over the lifetime of the development.
- Potential changes in the flow profile or throughflow of groundwater due to the interaction of the basement with groundwater.

8.2 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.

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

8.4 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.

8.5 A detailed investigation into the risk of flooding from surface water and groundwater sources (Chapter 9) and a SuDS assessment (Chapter 10) have therefore been completed to address these potential issues.

9.0 FLOOD RISK ASSESSMENT

9.1 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

9.2 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. "

9.3 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

9.4 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

9.5 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.

9.6 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 4.4.

[14] Available at: https:llcheck-long-term-flood-risk.service.gov.uk/risk [Accessed 28102/2023]

9.7 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 4.5.

9.8 Figure 4.5 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.

9.9 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.

9.10 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.

9.11 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.

9.12 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

9.13 A site ground investigation was undertaken on 3rd September 2024 by Southeastern Drilling Services Ltd which comprised of two boreholes dug to 6.00 and 10.00 m bgl. The boreholes confirmed available BGS mapping and identified topsoil to 0.90 m bgl underlain by brown sandy gravely clay between 1.70 - 2.30 m bgl, sands and gravels to 4.70 – 4.8 m and grey clay (London Clay) beyond (to end of borehole at 10 m bgl).

9.14 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,

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

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.

9.15 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.

9.16 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].

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

9.18 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.

9.19 Water was identified between 4.00 and 6.00 m bgl in both boreholes dug as part of site investigation works conducted by Southeastern Drilling Services Ltd in September 2024. The presence of dry strata below this indicates the water is perched groundwater.

9.20 Perched groundwater typically does not extend over large areas and is not indicative of the true water table level. BH 2 dug to 10 m bgl 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.

9.21 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.

9.22 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

9.23 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.

9.24 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.

9.25 The proposed development involves implementing a basement level 3.00 m below the ground floor level. This would place the basement at 9.600 m AOD. The basement floor and foundations are subject to specialist detailed design but will extend below the proposed basement FFL.

9.26 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.

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

9.28 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.

Flood Risk from Artificial Water bodies

9.29 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.

9.30 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 4.6).

[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
[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 July, 2024].

9.31 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.

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

Flood Risk from Public Sewers

9.33 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.

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

9.35 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 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.

9.36 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 the Appendix.

9.37 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.

9.38 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.

9.39 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 levels 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.

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

9.40 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

9.41 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.

9.42 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.

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

Historical Records of Flooding

9.44 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.

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

9.46 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].

9.47 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.

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

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

9.49 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.

9.50 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).

9.51 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.

Design Response to Flood risk

9.52 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.

9.53 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.

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

9.55 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.

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

10.0 SuDS ASSESSMENT

Planning policy

National Planning Policy Framework

10.1 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.

10.2 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

10.3 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."

10.4 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 June, 2024].

Local Plan - London Borough of Richmond

10.5 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."*

10.6 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.

10.7 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.* "

10.8 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. "

10.9 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*. "

10.10 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

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

10.12 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 10.1 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.

10.13 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 10.1 below.

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

Table 10.1: Proposed Site Runoff Rate

10.14 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.

10.15 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.

10.16 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).

10.17 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 June, 2024].

SuDS Drainage Principles

10.18 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

10.19 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."*

10.20 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.

10.21 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.

10.22 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.

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

10.24 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

10.25 The SuDS hierarchy shown in Table 10.2 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.

	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.

Table 10.2: SuDS Techniques and Application to the Development

10.26 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.

10.27 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.

10.28 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.

10.29 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

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

10.31 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.

10.32 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.

10.33 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.

10.34 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.

10.35 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.

10.36 The outline proposals restrict surface water flow rates to 1.0 l/s 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

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

10.38 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.

10.39 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.

10.40 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.

10.41 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.

10.42 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.

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

10.44 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.

10.45 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.

10.46 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

10.47 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:

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

Table 10.3: Calculated SuDS pollution mitigation indexes for the Site

10.48 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:

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

Table 10.4: Indicative SuDS mitigation indices

10.49 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

10.50 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.

10.51 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.

10.52 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

10.53 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.

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

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

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
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter;	Annually

	remove and replace surface infiltration medium as necessary.	
	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 10.5: Maintenance requirements for attenuation storage tank[28]

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

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

Table 10.6: Maintenance requirements for Green Roofs[29]

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	

Table 10.7: Maintenance requirements for Tanked Permeable Paving[30]

SuDS Summary

10.56 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

[29] Based on CIRIA C753

[30] Based on CIRIA C753

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.

10.57 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.

10.58 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.

10.59 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.

10.60 The LBR SuDS Pro-Forma is attached to the appendix.

10.61 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.

10.62 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.

11.0 BASEMENT IMPACT ASSESSMENT – FLOOD RISK & DRAINAGE

11.1 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.

11.2 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.

11.3 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.

11.4 As perched ground water 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.

11.5 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.

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

11.7 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.

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

11.9 The LBR Verification Form is included in the Appendix.

12.0 CONCLUSIONS AND RECOMMENDATIONS

12.1 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.

12.2 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.

12.3 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.

12.4 The site is located within permeable geology; Kempton Park Gravel Member confirmed by a site 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 2.00 – 4.00 m bgl during the borehole drilling. This was in permeable geology which was underlain with impermeable clay. No evidence of the true water table was found in the subsequent dry clay strata to 10 m bgl.

12.5 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.

12.6 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.

12.7 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.

12.8 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.