September 2020

SYON GARDENS

HOMEBASE BRENTFORD SITE, TW7 5QE

FLOOD RISK ASSESSMENT

Consultant: AECOM Ltd

St Edward
Designed for life

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	16/03/2020	Addressing client comments and updating drainage information.	Y	JS	Principal Flood Risk Consultant
2	03/070/2020	Drainage section updated to reflect updated drainage strategy.	Y	JS	Principal Flood Risk Consultant
3	30/07/2020	Updates based on consultation sheet and policy	Y	JS	Principal Flood Risk Consultant

Distribution List

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1. Introduction

1.1 Background

This Flood Risk Assessment (FRA) has been prepared by AECOM ('AECOM'), on behalf of St Edwards Homes Ltd ('the Applicant'), to support a planning application for a mixed-use development (residential and retail uses) on the Homebase Site in Brentford, London.

The Homebase Brentford Site (the "Site"), comprises approximately 1.4 hectares (ha) of brownfield land and is located off Syon Lane. The Site is centred at Ordnance Survey (OS) National Grid Reference (NGR) 516407, 177325.

St Edward Homes Limited is bringing forward the redevelopment of both the Tesco Osterley and Homebase Brentford sites. The existing Tesco store would be re-provided on the Homebase site as part of a mixed-use development with residential above, which releases the opportunity to deliver a comprehensive residential-led mixed-use development on the Tesco site.

This assessment is for the Homebase Site, Syon Lane only. More details for the Site, including a Site Location Plan, are provided in Section 2.

1.2 Purpose and Scope of the Assessment

The Environment Agency's (EA) 'Flood Map for Planning'[1] identifies that the Site is located entirely within Flood Zone 1, defined by the National Planning Policy Framework[2] (NPPF) and the Flood Risk and Coastal Change Planning Policy Guidance[3] (PPG), as land with a low probability of flooding (<0.1% Annual Exceedance Probability (AEP)) (1 in 1000 annual probability) of river or sea flooding. The Flood Zone definitions, as presented in Table 1 of the PPG, are defined in Table 4.1.

As the Proposed Development comprises an area in excess of one hectare (ha), a FRA is required to accompany any planning application for the development of the Site, as per the requirements of the NPPF[2].

The aim is to undertake a FRA that is appropriate to the nature and scale of the Proposed Development, which would meet the necessary requirements of current national and local planning guidance, and which will be sufficient to support the planning application for the Proposed Development. In order to meet this aim, the following was undertaken:

- Consultation with and obtaining data from London Borough of Hounslow (LBH) (in their role as Lead Local Flood Authority (LLFA) in regard to the Proposed Development, the flood risks posed to and by the Site and the necessary measures that would be required to protect the Site from flooding;
- Review of publicly available data to determine the flood risks associated with all sources of flooding including Main Rivers, Ordinary Watercourses, groundwater, artificial sources, surface water runoff/overland flow and drainage infrastructure; and
- Review of the Proposed Development parameter plans considering the identified flood risks and identification of measures, where necessary, that would manage any residual flood risk to and from the Site/ Proposed Development to acceptable levels.

1.3 Data Sources

The baseline conditions for the Site were established through a desk-based study and via consultation with key statutory consultees. This information has been used to inform the assessment made within the FRA. Data collected during this assessment is detailed in Table 1.1.

[1] Environment Agency (2019) Flood Map for Planning (Rivers and Sea). Available at https://flood-map-for-planning.service.gov.uk/ (accessed September 2019)
[2] Secretary of State for Ministry of Housing, Communities and Local Government. (2019). National Planning Policy Framework. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/733637/National_Planning_Policy_Framework_web_accessible_version.pdf
[3] Ministry of Housing, Communities and Local Government. March 2014. Planning Practice Guidance: Flood risk and coastal change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change

Table 1-1: Sources of Data

Purpose	Data Source	Comments
Identification of Hydrological Features	1: 25,000 Ordnance Survey (OS) mapping	Identifies the position of the Site and local hydrological features.
Historical Land Use and Hydrological Features	Historic OS maps dating back from 1850-present [4]	Identify historical land use change and hydrological features over the 168 years.
Geology, Hydrogeology and Groundwater Levels	Geo-Environmental Assessment[5]	Identification of geological succession beneath the Site, aquifer designations and groundwater levels.
Identification of Existing Flood Risk	OS mapping and Geo-Environmental Assessment	Indication of existing Site levels based on OS spot levels and borehole levels.
	EA Indicative Flood Zone Map (online)[1]	Identifies fluvial/ tidal inundation extents and historical flooding.
	EA Flood Inundation Mapping and Risk of Flooding from Surface Water (online)[6]	Provides information on the risk of flooding from reservoirs (artificial sources) and surface water.
	West London Strategic Flood Risk Assessment[7] (SFRA);	Assesses flood risk across the LBH boundary area. Includes flood risk from fluvial/tidal, sewers, overland flow and groundwater.
	LBH Preliminary Flood Risk Assessment [8] (PFRA);	
	LBH Surface Water Management Plan [9] (SWMP)	
	British Geological Survey (BGS) records	Provides details of geology and hydrogeology in the vicinity of the Site.
Identification of Historical Flooding	EA Mapping	Gives details of historical flooding.
	LBH SFRA	
	LBH PFRA	
Details of the Proposed Development	Design Plans	Provides layout of the Proposed Development.
Surface Water Drainage	Thames Water Consultation Response (Appendix A)	Identifies existing Site drainage, and TWUL drainage infrastructure near the Site.
		Proposed surface water management strategy for the lifetime of the development
	LBH Drainage Assessment Form (Appendix B)	Provides the drainage details for the Site in the required format to support the planning application.

[4] Ordnance Survey. Maps from 1857-1986. Available at: https://www.old-maps.co.uk/
[5] Watermans (2019) Homebase Syon Lane Geo-Environmental Assessment (August 2019)
[6] Environment Agency. Flood Risk from Reservoirs. Available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk
[7] West London Alliance (2018). West London Strategic Flood Risk Assessment. Available at: https://westlondonsfra.london/
[8] Capita Symonds and Scott Wilson for London Borough of Hounslow (2011) London Borough of Hounslow Preliminary Flood Risk Assessment. Available at: https://webarchive.nationalarchives.gov.uk/20140328094444/http://www.environment-agency.gov.uk/research/planning/135542.aspx#18
[9] Capita Symonds and Scott Wilson for London Borough of Hounslow (2011) London Borough of Hounslow Surface Water Management Plan. Available at: https://hounslow.app.box.com/s/q2alftiztj8e1qb2hprck7cqcypw9fua

2. The Existing Site

2.1 Location

The Site is a rectangular plot of land, with a total site area of 1.4 hectares (ha), located on the corner of Syon Lane and the Great West Road at Gillette Corner, TW7 5QE in the London Borough of Hounslow. The Site is situated within the Osterley and Spring Grove ward. A Site location plan is provided as Figure 1 below.

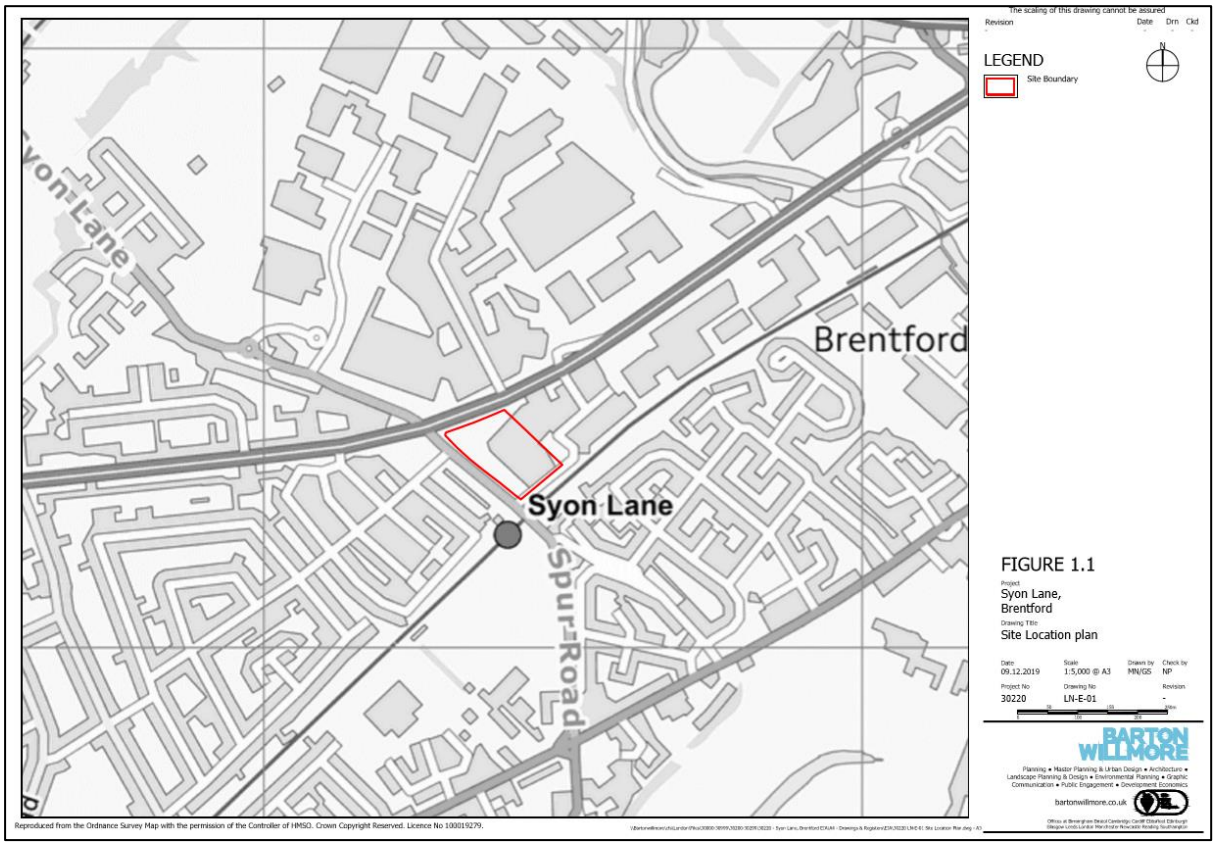

Figure 1 Site Location Plan

2.2 Existing Land Use

The site is developed with a large Homebase store (4,180sqm) and associated surface car parking and under-croft car parking (295 spaces). The Homebase store comprises of a large industrial style shed with metal cladding. The building is effectively two storeys high with a central pylon to the front.

The Site is bound by the A4 Great West Road to the north, and Syon Lane to the south-west. There is a car showroom to the east, and a service road, Syon Gate Way, which extends along the south-eastern boundary, and further along is Syon Lane station and railway line.

2.3 Access

The Site is generally well connected with a variety of different means of accessing the Site. The primary vehicular access to the Site is from a wide junction off Syon Lane. It currently provides access to the Homebase store car park and delivery area as well as to the deck of car parking close to the railway.

Pedestrian access is also available on Syon Lane at the same point as the vehicular access, and at a number of locations along the Great West Road frontage.

2.4 Surrounding Land Use

The surrounding area comprises a mix of uses including commercial and residential development. There are semi-detached houses on the western side of Syon Lane, opposite the Site. Along the Great West Road there is a variety

of commercial and industrial uses as well as some residential uses, whilst further along Syon Lane the uses are predominantly residential.

2.5 Hydrology and Flood Risk Management Infrastructure

2.5.1 Surface Water Features

Using OS mapping and the EA Catchment Data Explorer website[10] the following surface waterbodies were identified within proximity of the Site.

2.5.1.1 River Brent/Grand Union Canal

The River Brent, classified as an EA Main River, is located approximately 0.7 km north east of the Site at its closest point. The River Brent is joined from the west by the main line of the Grand Union Canal at the foot of the Hanwell flight of locks approximately 2.4 km north west of the Site. From here, the River Brent, now known as the Grand Union Canal, is canalised and navigable passing through Osterley Lock, Clitheroe's Lock and Brentford Gauging Locks. The Grand Union Canal joins the tidal River Thames at Thames tidal locks, a mile upstream of Kew Bridge, approximately 1.6 km east of the Site.

2.5.1.2 River Thames

The River Thames, classified as an EA Main River, is located approximately 1.3 km south east of the Site at its closest point and is tidally influenced in this location. The River Thames flows in a north easterly direction in the reach closest to the Site before meandering through Brentford and Barnes.

2.5.1.3 Minor Watercourses/ Water Features

There are no minor watercourses or water features in close proximity to the Site. The nearest minor watercourses and/or water features are located approximately 650m to the south east within Syon Park (lake) and 856m and 1.17km to the north west within Wyke Green Golf Course (minor watercourse/drainage channel) and Osterley Park (minor watercourse/drainage channel and lake complex) respectively.

2.5.2 Flood Defences

There are no formal flood defences located near the Site. The EA Flood Map for Planning shows flood defences are located along the River Thames to the south of the Site and along the lower reach of the River Brent, to the south of London Road, to the east of the Site.

2.6 Topography

The Site slopes from the Great West Road to the north, down towards the Sites southern boundary towards the railway line. There is a drop of approximately 4m from the north-west corner of the Site to the South of the Site along Syon Gateway.

The railway line is located well below Site level and is screened by mature trees.

2.7 Anticipated Ground Conditions and Hydrogeological Significance

The likely ground conditions at the Site have been established from BGS mapping Sheet 270 – South London, Bedrock and Superficial Edition, online BGS borehole logs TQ17NE136, TQ17NE140 and TQ17NE240 (accessed online 22/10/2018) and the online Geology of Britain Viewer (BGS)[11]. Hydrogeological significance of the strata has been established from MAGIC online geographical dataset[12] (accessed online November 2019). Table 2.1 shows the geological succession beneath the Site based on this information.

[10] Environment Agency Catchment Data Explorer website, available at http://environment.data.gov.uk/catchment-planning/, accessed March 2019;
[11] http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[12] https://magic.defra.gov.uk/magicmap.aspx

Table 2.1 Anticipated Ground Conditions at the Site

Stratum	Anticipated Nature	Estimated Thickness (m)	Aquifer Designation	EA Aquifer Definition
Made Ground	Bituminous/concrete hardstanding over variable fill material. Likely to comprise sand, gravel, clay and silt of varying proportions with brick and concrete.	2m	Non - Aquifer	May contain residual pockets of water.
Taplow Gravel Member – Sand and Gravel	Slightly silty and gravel	Up to 3m (potentially absent in the south)	Principal	Permeable layers of rock or drift deposits that provide a high level or water storage and support water supply and/ or river base flow on a strategic scale.
London Clay Formation	Silty clay with claystone	80m	Unproductive Strata	Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

Source: Homebase Syon Lane Geo-Environmental Assessment[5]

Soils in the location of the Site are described as Loamy with a naturally high-water table[13]. Loamy soils are described to have a mixture of sand, silt and clay sized particles. The soils are described as having moderate permeability allowing soils to freely drain surface waters[14] and are affected by high ground water that has drained from the surrounding landscape.

2.8 Groundwater Levels

The closest borehole records, taken from the British Geological Survey records provide a likely indication of groundwater levels in the vicinity of the Site. The following records have been used in the assessment:

- Borehole Ref - TQ17NE242 — Brentford RTS BH34 (OS NGR 516730,177700): Water struck at 6.1 m below ground level (bgl);
- Borehole Ref - TQ17NE241 — Brentford RTS BH33 (OS NGR 516700,177740): Water struck at 5.8 m bgl; and
- Borehole Ref - TQ17NE138 — 52 London Road Brentford (OS NGR 517060,177180): Water level 4.66 m bgl.

Groundwater level monitoring was undertaken in November 2018 to inform the Geo-Environmental Assessment. Recorded groundwater levels are detailed in Table 2.2.

Table 2.2 Recorded Groundwater Levels

Monitoring Point	Ground Level (mAOD)	Depth to Groundwater (bgl)	Groundwater Level (mAOD)
BH1	18.70	2.43	16.27
BH2	20.15	2.70	17.45
BH3	16.70	N/A (Dry)	N/A (Dry)
WS1	TBC	0.90	TBC
WS2	15.00	0.95	14.05
WS3	19.97	N/A (Dry)	N/A (Dry)

Source: Homebase Syon Lane Geo-Environmental Assessment

The Geo-Environmental Assessment report states:

"*Monitoring in BH1 and BH2 indicates groundwater is present in the Taplow Gravel Member in the north of the Site, whereas WS1 and WS2 indicate the presence of perched water in Made Ground. BH3, screening Made Ground,*

[13] Soilscape- Cranfield Soil and AgriFood Institute http://www.landis.org.uk/soilscapes/index.cfm
[14] Lewis, Cheney and Dochartaigh (2006). 'Guide to Permeability Indices', British Geological Survey

was dry at the time of monitoring. The recorded groundwater level in BH1 (2.43m bgl) indicates groundwater had risen above the screen section of the monitoring well (3.00- 5.00m bgl), potentially due it being confined by a buried concrete slab between recorded 2.60 and 2.75m bgl over the Taplow Gravel Member.

The differential between groundwater levels recorded in the north and the south of the Site indicate groundwater is discontinuous. This is potentially due to the absence of granular deposits of the Taplow Gravel Member in the south of the Site.

Whilst identification of groundwater flow direction on-Site was not possible, it is likely groundwater in the wider area flows east towards the River Thames".

The Site is not located within a source protection zone (SPZ) for groundwater sources such as wells, boreholes and springs used for public drinking water supply.

3. The Proposed Development

The planning application seeks permission for the:

"Full planning application for the demolition of existing building and car park and erection of buildings to provide residential units, a replacement retail foodstore with additional commercial, business and service space, and a flexible community space, and ancillary plant, access, servicing and car parking, landscaping and associated works"

Development proposals comprise:

- Demolition of the existing Homebase store;
- Delivery of 473 high quality homes;
- 38% affordable housing (on a habitable room basis);
- A new and modern Tesco retail store of circa 10,550 sqm (GIA);
- Community space of 200 sqm (GIA);
- 137 sqm (GIA) of flexible commercial, business and service space;
- 400 retail car parking spaces;
- 100 residential car parking spaces;
- 3 residential visitor car parking spaces and 2 car club spaces;
- 204 retail cycle parking spaces;
- 896 residential cycle parking spaces;
- Building heights include a four-storey podium with blocks ranging up to seventeen storeys;
- Communal residential amenity space with biodiverse podium gardens including open space and children's play space;
- New active frontages and improved, safer public realm along Syon Lane and the Great West Road;
- Dedicated new pedestrian and cycle friendly 'clean air' route provided between Syon Lane Station and the Great West Road via Syon Gate Way and new eastern street, Syon Gate Lane.

4. Planning Policy

The following planning policies and guidance are relevant to the Proposed Development with regards to flood risk and surface water management.

4.1 National Policy

4.1.1 National Planning Policy Framework (NPPF)

Published by the Ministry of Housing, Communities and Local Government, the NPPF[2] was updated in June 2019, thereby superseding the previous versions published in 2012, 2018 and February 2019. The NPPF has three overarching objectives to contribute to the achievement of sustainable development, one of which is the 'environmental objective'. This objective includes the requirement of "helping to improve biodiversity, using natural resources prudently, and minimising waste and pollution" (Paragraph 8c).

The NPPF contains several statements which are relevant to flood risk. These include:

- Strategic policies should set out an overall strategy for:
  - infrastructure for transport, telecommunications, security, waste management, water supply, wastewater, flood risk and coastal change management, and the provision of minerals and energy (including heat) (paragraph 20b);
  - the pattern, scale and quality of development, and make provision for conservation and enhancement of the natural, built and historic environment. This includes landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation (paragraph 20d);
- Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts. Development should not cause unacceptable levels of water pollution and should help improve water quality wherever possible (paragraph 149);
- 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 (paragraph 155)
- Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
  - take account of advice from the lead local flood authority;
  - have appropriate proposed minimum operational standards;
  - have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
  - where possible, provide multifunctional benefits (paragraph 165).

The requirements of the NPPF with regards flood risk have been taken into account in the assessment.

4.1.2 Planning Policy Guidance (PPG)

The PPG[3] provides guidance for local planning authorities on assessing the significance of water environment effects of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development.

The NPPF and Flood Risk and Coastal Change section of the PPG[3] recommend that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs). Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- applying the Sequential Test;
- applying the Exception Test, if necessary;
- safeguarding land from development that is required for current and future flood management;
- using opportunities offered by new development to reduce the causes and impacts of flooding; and
- where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

The Flood Zone definitions, as presented in Table 1 of the PPG, are defined in Table 4.1 below.

Table 4.1 NPPF PPG Flood Zone Definitions

Flood Zone	Definition
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1% AEP)
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1% AEP), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5% AEP)
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1% AEP), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP)
Flood Zone 3b (functional Floodplain)	Land where water has to flow or be stored in times of flood (Not separately distinguished from Zone 3a on the Flood Map).

Source: Table 1 of the PPG[3].

As discussed in Section 1.2 and Section 5, the EA's 'Flood Map for Planning'[1] identifies that the Site is located wholly within Flood Zone 1.

4.1.2.1 The Sequential Test and Exception Test

The overall aim of the Sequential Test is to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, local planning authorities allocating land in Local Plans or determining planning applications for development at any location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3a be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test, if required.

However, the PPG also confirms that:

> *"The Sequential Test does not need to be applied for individual developments on sites which have been allocated in development plans through the Sequential Test"*

LBH is currently in the process of preparing its Great West Corridor (GWC) Local Plan Review[15] and Site Allocations Documents[16], setting out a vision for the borough for the next 15 years. The Local Plan Review Site Allocations document sets out at Site allocation 11 that the Homebase Syon Lane Site is allocated for a mixed-use development.

For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and

a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

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Both elements of the test will have to be passed for development to be permitted.

[15] London Borough of Hounslow (2019) Great West Corridor Local Plan Review. Volume 4 Pre-submission Regulation 19 Consultation. July 2019.
[16] London Borough of Hounslow (2019) Site Allocations Local Plan Reviews. Volume 2 Pre-submission Regulation 19 Consultation. July 2019

4.1.2.2 Development and Flood Risk Vulnerability

Table 4-2 shows the classification of flood risk vulnerability and flood zone compatibility according to Section 7, Paragraph 066 of the PPG.

Table 4-2: Flood Risk Vulnerability and Flood Zone Compatibility

Flood risk Vulnerability classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Flood plain'	Exception test required	✓	×	×	×

Key
✓ Development is appropriate.
× Development should not be permitted

The following vulnerability classifications for the separate elements of the Proposed Development are outlined below:

- Residential Use – More Vulnerable;
- Retail, Commercial, Employment and car parking – Less Vulnerable; and
- Open Space, Formal areas of Play, and associated facilities and amenity space, including, landscaping, green infrastructure and sustainable drainage systems – Water Compatible.

Based on the classification shown in Table 3-2 the Proposed Development is appropriate in Flood Zone 1.

4.1.3 Planning Practice Guidance: Climate Change

Under separate planning guidance, the EA published updated climate change allowances in February 2016[17] to support NPPF, which supersede all previous allowances written in the 'PPG: Flood Risk & Coastal Change' and are predictions of anticipated change for:

- Peak river flow by River Basin District;
- Peak rainfall intensity;
- Sea level rise; and,
- Offshore wind speed and extreme wave height.

These should be considered within a FRA in regard to future impacts from climate change on site specific planning applications. The EA's guidance outlines how and when allowances should be applied for FRAs.

4.1.3.1 Tidal Climate Change Allowances

Table 4.3 Sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Table 4.3 is an extract replicated from Table 3 of the EA guidance detailing the anticipated rise in sea levels up to 2115.

[17] Environment Agency. (February 2016) Flood risk assessments: climate change allowances. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Table 4.3 Sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	Allowance	2000 to 2035	2036 to 2065	2066 to 2096	2096 to 2125	Cumulative rise 2000 to 2125 / metres (m)
South East	Upper End	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.6
	Higher Central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.2

For FRAs both the central and upper end allowances should be assessed to understand the range of impact.

4.1.3.2 Fluvial Climate Change Allowances

For proposed developments in areas of fluvial flood risk, the flood risk vulnerability classification, flood zone and lifetime of development are of particular importance to determine the correct climate change allowance as detailed in Table 4.4.

Table 4.4 EA Climate Change Allowances to apply based upon the Flood Zone and Development Lane Use Vulnerability

	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential Infrastructure
Flood Zone 2	NA	CA	Assess CA & HCA	Assess HCA & UEA	Assess HCA & UEA
Flood Zone 3a	CA	Assess CA & HCA	Assess HCA & UEA	X	UEA
Flood Zone 3b	CA	X	X	X	UEA

NA = No Allowance; CA = Central Allowance; HCA = Higher Central Allowance; UEA = Upper End Allowance; X = Development not permitted

As the Proposed Development is defined as 'More Vulnerable' from the vulnerability classifications in Table 2 of the NPPF, the corresponding percentages that should be assessed at sites within the Thames River Basin District are listed in Table 4.5.

For Proposed Developments located in Flood Zone 1 the EA guidance promotes the use of the central allowance for essential infrastructure, highly vulnerable, more vulnerable and less vulnerable developments. For water compatible developments none of the allowances are required to be assessed. The +25% allowance for climate change is therefore applicable to the Proposed Development at the Site as the proposed lifespan is approximately 100 years.

Table 4.5 EA Peak River Flow Climate Change Allowances for the Thames River Basin District

	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End Allowance	25%	35%	70%
Higher Central Allowance	15%	25%	35%
Central Allowance	10%	15%	25%

4.1.3.3 Pluvial Climate Change Allowances

To account for the anticipated changes in rainfall intensity, the EA's guidance (as shown in Table 4.6) states that a FRA for an expected 100 year lifespan of the Proposed Development should assess the 'Upper End' allowance to understand the potential impact and make suitable decisions to mitigate against pluvial flooding.

Table 4.6 EA Peak Rainfall Intensity Climate Change Allowances across England

	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End Allowance	10%	20%	40%
Central Allowance	5%	10%	20%

Therefore, a +40% allowance for climate change is applicable to the Proposed Development at the Site. This has been taken into account in the calculations of surface water runoff rates and volumes in the Outline Drainage Strategy for the Site.

When assessing a range of allowances for peak river flow or rainfall intensity, the following must be considered:

- likely depth, speed and extent of flooding for each of the assessed climate change allowances;
- vulnerability of the proposed development types or land use allocations to flooding;
- 'built in' resilience measures used, for example, raised floor levels; and
- capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.1.4 National Design Guide

The NPPF makes clear that creating high quality buildings and places is fundamental to what the planning and development process should achieve. The National Design Guide, published on 1st October 2019, illustrates how well-designed places that are beautiful, enduring and successful can be achieved in practice. It forms part of the Government's collection of planning practice guidance and should be read alongside the separate planning practice guidance.

Sections of the guidance relevant to the Proposed Development include:

- **N2 Improve and enhance water management** which states, "*Well designed places integrate existing, and incorporate new natural features into a multifunctional network that supports quality of place, biodiversity and water management, and addresses climate change mitigation and resilience*"; and
- **R3 Maximise resilience** which states "*Well designed places contribute to community resilience and climate adaptation by addressing the potential effects of temperature extremes in summer and winter, increased flood risk, and more intense weather events such as rainstorms.*" R3 also states "*Well designed places have sustainable drainage systems to manage surface water, flood risk and significant changes in rainfall. Urban environments make use of green sustainable drainage systems and natural flood resilience wherever possible. Homes and buildings also incorporate flood resistance and resilience measures where necessary and conserve water by harnessing rainfall or grey water for re-use on-site.*"

4.1.5 Non-Statutory SuDS Guidance

DEFRA published their Sustainable Drainage Systems: Non-Statutory Technical Standards (NSTS) in March 2015[18] setting the requirements for the design, construction, maintenance and operation of SuDS. The NSTS are intended to be used alongside the NPPF and PPG.

The NSTS that are of chief concern in relation to the consideration of surface water flood risk to and from the development relate to runoff destinations, peak flow control and volume control. Additional guidance is provided for structural integrity, designing for maintenance considerations and construction.

[18] Defra. (2015). Sustainable Drainage Systems: Non-Statutory Technical Standards. Available at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

4.2 Regional Planning Policy

4.2.1 The London Plan

The London Plan[19] sets out an integrated social, economic and environmental framework for the future development of London to 2031. The Plan also includes a number of key policies aimed to assist protection of the water environment during redevelopment and construction.

Policies of relevance to water resources and flood risk within the context of the Proposed Development include:

- Policy 2.18 Green Infrastructure – The promotion of Sustainable Drainage Systems (SuDS) will improve water resources, flood mitigation and reduce flood risk;
- Policy 5.11 Green Roof and Development Site Environs – Major developments should include roof, wall and site planting in their design to achieve sustainable urban drainage by absorbing rainfall and thereby reducing flooding associated with surface water runoff;
- Policy 5.12 Flood Risk Management - Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated PPG on flood risk over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 (TE2100) and Catchment Flood Management Plans;
- Policy 5.13 Sustainable Drainage – Developers should aim for a greenfield runoff rate from their developments. Greenfield runoff rates are defined as the runoff rates from a site, in its natural state, prior to any development. Typically, this is between 2 and 8 litres per second per hectare. The CIRIA SuDS Manual[20] generally recommends the Institute of Hydrology Report 124[21] methodology for calculating greenfield runoff rates

  Achieving a greenfield runoff rate is of particular importance where the development is located in a catchment that contributes to combined sewers with known and/or modelled capacity or flooding issues. Information to determine whether capacity/flooding issues exist is available from borough SWMPs and SFRAs as well as other historic data.

  If greenfield runoff rates are not proposed, developers will be expected to clearly demonstrate how all opportunities to minimise final site runoff, as close to greenfield rate as practical, have been considered. This should be done using calculations and drawings appropriate to the scale of the application. In order to achieve this, applicants should:

  – Consider the permeability of all existing and proposed surfaces on the application site;
  – Assess the existing surface water and foul drainage networks and their discharges; and
  – Assess a range of return periods (the probability of a rainfall event of a particular size occurring and resulting in flooding) up to and including the 1 in 100 year plus climate change critical storms (an additional 20-30%).

4.2.2 Intend to Publish London Plan (2019)

The Examination in Public (EiP) on the Draft New London Plan[22] was held between 15th January and 22nd May 2019. Since this time, a Panel of Inspectors, appointed by the Secretary of State, issued their report and recommendations to the London Mayor on 8th October 2019.

The London Mayor has since considered these recommendations and, on the 9th December 2019, issued to the Secretary of State his intention to publish the London Plan as well as publishing the Intend to Publish Version of the London Plan. The Secretary of State wrote to the Mayor to request that changes were made to the Intend to Publish London Plan in March 2020. At present, the text of the Draft New London Plan is being informally agreed with MHCLG and Secretary of State, with a view of adoption in Summer 2020.

As such, the Intend to Publish London Plan has significant weight given its stage of preparation. Generally, the policies referenced in this Statement are not affected by the Secretary of State's comments and therefore can be

[19] Greater London Authority (2016) The London Plan March 2016
[20] Woods-Ballard *et al* (2007) The SuDS Manual (CIRIA 697)
[21] Marshall (1994): Report no. 124 Flood estimation for small catchments (Institute of Hydrology)
[22] Greater London Authority (2019) The London Plan. Intend to Publish. Spatial Development Strategy for Greater London. December 2019.

given full weight. For those that are under discussion with the Secretary of State, this is identified and accounted for. The relevant policies that apply to the development include:

The Intend to Publish Version of the London Plan was published in December 2019.

Relevant policies for water resources and flood risk within the context of the Proposed Development include:

- Policy GG6 Increasing Efficiency and Resilience – To help London become a more efficient and resilient city, those involved in planning and development must (B) ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, whilst mitigating against and avoiding contributing to the heat island effect.
- Policy G1 Green Infrastructure – London's network of green and open spaces, and green features in the built environment should be protected and enhanced. Green infrastructure should be planned, designed and managed in an integrated way to achieve multiple benefits. The green infrastructure approach recognises that the network of green and blue spaces, street trees, green roofs and other major assets such as natural or semi-natural drainage features must be planned, designed and managed in an integrated way;
- Policy G5 Urban Greening – Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature based sustainable drainage;
- Policy SI5 Water Infrastructure - E Development proposals should:

  a. seek to improve the water environment and ensure that adequate wastewater infrastructure capacity is provided

  b. take action to minimise the potential for misconnections between foul and surface water networks.

  F Development Plans and proposals for strategically or locally defined growth locations with particular flood risk constraints or where there is insufficient water infrastructure capacity should be informed by Integrated Water Management Strategies at an early stage.
- Policy SI12 Flood Risk Management - Current and expected flood risk from all sources across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers. Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses. Development proposals must have regard to measures proposed in Thames Estuary 2100 (TE2100) Plan. The policy recognises that measures to address flood risk should be integral to development proposals and considered early in the design process. This will ensure they provide adequate protection, do not compromise good design, do not shift vulnerabilities elsewhere, and are cost effective;
- Policy SI13 Sustainable Drainage - Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks.

  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:

  – rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation);

  – rainwater infiltration to ground at or close to source;

  – rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens);

  – rainwater discharge direct to a watercourse (unless not appropriate);

  – controlled rainwater discharge to a surface water sewer or drain;

  – controlled rainwater discharge to a combined sewer.

  Development proposals for impermeable surfacing should be refused unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways;

Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improve river water quality, and enhance biodiversity, urban greening, amenity and recreation.

The London Sustainable Drainage Action Plan[23] complements this policy and contains a series of actions to make the drainage system work in a more natural way with a particular emphasis on retrofitting.

The broad principles of the policies included in the new London Plan, in relation to flood risk and drainage, remain the same as the existing London Plan (see Section 3.2.1). Additional guidance is included within Policy SI13 Sustainable Drainage to follow the hierarchy of drainage and required to achieve greenfield run-off rates at the Site. This FRA has considered the draft New London Plan policy and seeks to meet the requirements of the draft New London Plan where appropriate.

The adopted London Plan remains the development plan until such time that the draft New London Plan is adopted.

4.2.3 Supplementary Planning Guidance – Sustainable Design and Construction

The London Plan Sustainable Design and Construction Supplementary Planning Guidance[24] (SPG) updated the standards that were developed for the Mayor's SPG on Sustainable Design and Construction in 2006[25] with a list of 'Mayor's Priorities' and best practice approaches for sustainable design and construction. The following sections of the SPG inform this FRA:

- Section 3.4.8: Most developments referred to the Mayor have been able to achieve at least 50% attenuation of the undeveloped site's surface water runoff at peak times. This is the minimum expectation from development proposals;
- Section 3.4.7: If greenfield runoff rates are not proposed, developers will be expected to clearly demonstrate how all opportunities to minimise final site runoff, as close to greenfield rate as practical, have been taken;
- Section 3.4.10: All developments on greenfield sites must maintain greenfield runoff rates. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. The only exceptions to this, where greater discharge rates may be acceptable, are where a pumped discharge would be required to meet the standards or where surface water drainage is to tidal waters and therefore would be able to discharge at unrestricted rates provided unacceptable scour would not result;
- Section 3.4.14: Development should utilise SuDS unless there are practical reasons for not doing so. The aspiration is to deliver SuDS schemes that provide multiple benefits, in addition to reducing flood risk; and
- Section 3.4.15: SuDS should be fully justified by adopting techniques in a hierarchical manner, maximising the use of those techniques higher up the hierarchy and those that deliver multi-functional benefits before considering others further down the hierarchy.

Table 4-7 below replicates Table 3.1 in the Sustainable Design and Construction SPG, which outlines the SuDS hierarchy.

Paragraph 3.4.9 of the SPG states that there may be situations where it is not appropriate to discharge at greenfield runoff rates. These include, for example, sites where the calculated greenfield runoff rate is extremely low, and the final outfall of a piped system required to achieve this would be prone to blockage. An appropriate minimum discharge rate would be 5 litres per second per outfall.

[23] Greater London Authority (2016) London Sustainable Drainage Action Plan 2016
[24] Greater London Authority (2014); 'Supplementary Planning Guidance – Sustainable Design and Construction'
[25] Greater London Authority (May 2006); 'Supplementary Planning Guidance – Sustainable Design and Construction'

Table 4-7: SuDS Hierarchy set out in the Sustainable Design and Construction SPG

	SuDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	Living Roofs	✓	✓	✓
	Basins and ponds 1. Constructed wetland 2. Balancing ponds 3. Detention basins 4. Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices 5. Soakaways 6. Infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains 7. Gravelled areas 8. Solid paving blocks 9. Porous paviors	✓	✓	
Least Sustainable	Tanked systems 10. Over-sized pipes/ tanks 11. Box storage systems	✓		

- Section 3.4.26: An appropriate design life should be set for each development in order to inform the climate change allowances to be applied in FRAs. For residential developments the design life should be at least 100 years and at least 60 years for commercial developments;

4.2.4 London Environment Strategy

The Mayor's London Environment Strategy[26] was published 31 May 2018 and sets out the Mayor's vision of London's environment to 2050. The London Environment Strategy includes a number of policies and aspirations, with an accompanying implementation plan, setting out actions the Mayor is prioritising for the next five years to help implement the aims of this strategy.

The following policies are relevant in terms of flood risk:

- Policy 8.1.1: Sectors understand the impacts of severe weather and climate change prioritise the keys risks, and identify mitigation measures where appropriate;
- Policy 8.2.1: Reduce the risk and manage the impacts of surface water, sewer, fluvial, reservoir and groundwater flooding in London;
- Policy 8.2.2: Ensure London maintains its standard of protection from increasing risk of tidal flooding;
- Policy 8.2.3: Increase the amount of sustainable drainage, prioritising greener systems across London in new development, and also retrofit solutions;
- Policy 8.2.4: Work with Stakeholders to improve London's sewerage system so it is sustainable, resilient and cost effective, and make best use of innovation;
- Policy 8.3.1: Reduce London's water consumption and leakage rate; and
- Policy 8.3.2: Support planning for new strategic water resources appropriate for London.

[26] GLA, (2018); London Environment Strategy.

4.2.5 London Sustainable Drainage Action Plan

The London Sustainable Drainage Action Plan[23], prepared in 2016, addresses a specific need to promote the awareness, and the retrofitting, of sustainable drainage systems right across London. It contains a series of actions to make the drainage system work in a more natural way which will bring a wide range of benefits. The Action Plan aims to achieve a 1% reduction in surface water flows in the sewer network each year for 25 years, resulting in a 25% reduction in flows by 2040. By 2040 it is envisioned that London will manage its rainwater sustainably to reduce flood risk and improve water security, maximising the benefits for people, the environment and the economy.

4.3 Local Planning Policy

4.3.1 London Borough of Hounslow Council Local Plan

The Hounslow Local Plan[27/28] was adopted on 15th September 2015 by Hounslow Borough Council. Until 2030, it will form part of the planning framework of the borough.

Plan policies relevant to flood risk and the Proposed Development include:

- **Policy GB4 – The Green Infrastructure Network:** LBH expect developers to incorporate elements of green infrastructure on site to integrate into the wider network of green infrastructure and assist in the greening of the borough. This may include provision of green roofs, sustainable drainage systems, trees, squares, plazas and pedestrian routes.
- **Policy EQ2- Sustainable Design and Construction:** LBH will promote the highest standards of sustainable design and construction in development to mitigate and adapt to climate change. This will be achieved by:

  c.Promoting sustainable design and construction, consistent with the principals established in the London Plan, including sustainable drainage, the reuse and recycling of construction materials, green roofs and urban greening;

  d. Using national standards for sustainable design and construction to assess environmental credentials of developments and requiring schemes to meet specified levels as a minimum.
- **Policy EQ3-Flood Risk and Surface Water Management:** LBH will ensure that flood risk is reduced by ensuring that developments are located appropriately and incorporate any necessary flood resistance measures. In addition, surface water will be managed through an increased emphasis on sustainable drainage. This will be achieved by:

  a. Using the sequential and exceptions tests to inform planning decisions in flood risk areas to ensure inappropriate development is avoided. It is expected that development proposals will include flood risk assessments consistent with the requirements of the EA and SFRA;

  b. Promoting improved surface water drainage across the borough, by working with partners to identify, manage and reduce the risk of surface water flooding. Development proposals should incorporate sustainable drainage systems and avoid non-permeable hardstandings with the aim of achieving greenfield runoff rates and being consistent with the SWMP;

  c. Promoting the opening up of river corridors and making space for water through the creation of buffer zones to watercourses and increasing floodplain connectivity;

  d. Working with partners to ensure the provision and maintenance of flood defences, in line with the Infrastructure Development Plan;

  e. Encouraging the take up of opportunities to improve flood resistance and resilience in the borough's existing built environment, including drainage improvements, flood guards and raising electrical sockets and other vulnerable fittings; and

  f. Working with the EA to implements actions of the Thames Estuary 2100 Plan.

4.3.2 Emerging Local Plan Review Pre-Submission Regulation 19 Consultation (2019)

Hounslow is currently in the process of preparing its GWC Local Plan Review[15] and Site Allocations Documents[16], setting out a vision for the borough for the next 15 years. The Plans have undergone extensive consultation but not yet been taken to Examination, so has to be considered in this context and given proportionate weight compared

[27] London Borough of Hounslow (2015). Local Plan 2015 – 2030. Volume 1
[28] London Borough of Hounslow (2015). Local Plan 2015 – 2030. Volume 2

to adopted policy. However, it is noted that it comprises more recent policy that responds to other key emerging and adopted policies. Relevant policies include:

- Policies GWC1 – GWC 6 sets out the spatial policies, including employment growth, housing, heritage, environmental quality and open space, and transport; and
- Policies P1 and P2 provide spatial guidance that focuses on the growth and regeneration of the west, central and east areas of the GWC.

The Local Plan Review Site Allocations document sets out at Site allocation 11 that the Homebase Syon Lane is allocated for a mixed-use development.

4.4 Other Relevant Policy and Guidance

4.4.1 London Regional Flood Risk Appraisal

The London Regional Flood Risk Appraisal (RFRA)[29] seeks to ensure that the overall flood risk in Greater London does not increase. The RFRA contains 11 recommendations for reducing flood risk, to be implemented by the EA and other agencies. The most pertinent of these recommendations in relation to the Proposed Development is that developments should reduce surface water discharge in line with the sustainable drainage hierarchy set out in Policy SI13 of the London Plan. In relation to the Great West Corridor/ Golden Mile, the Appraisal states "*New development is a good opportunity to introduce more sustainable rainwater management and should readily be able to achieve a substantial reduction on current run-off rates and reduce the current risks*".

4.4.2 The Thames Estuary 2100 Plan

The Thames Estuary 2100 Plan[30] (TE 2100) was developed by the EA and approved by Government in November 2012. It provides strategic direction for managing flood risk in the Thames Estuary to the end of the century and includes requirements to maintain and raise some tidal defences. TE 2100 is an adaptive plan, which considers different long-term options for managing flood risk, including sea level rise.

4.4.3 LBH Strategic Flood Risk Assessments

The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow commissioned the production of a joint Level 1 SFRA[6] which was published on-line in April 2018. A joint SFRA enables the identification of potential improvements which the Boroughs are recommended to adopt and enforce through their future Local Plans to improve local flood risk whilst promoting sustainable development.

The overarching aim of the SFRA is to provide the evidence base for ensuring development is steered away from areas identified most at risk from all sources of flood risk, reducing the risk of flooding to residents and buildings.

A Level 2 SFRA[31] was commissioned by the London Borough of Hounslow and published in January 2019. The assessment looks at 11 'Capacity Sites 'put forward for further assessment. The primary purpose of this Level 2 SFRA is to provide the information necessary for application of the Exception Test where appropriate. Level 2 assessments also provides spatial planning and site-specific recommendations to support any potential development opportunities for prospective developers. The Proposed Development site is not included as a Capacity Site.

4.4.4 LBH Local Flood Risk Management Strategy

The LBH Local Flood Risk Management Strategy[32] (LFRMS) details the flood risks that the Borough faces including flooding from the tidal River Thames, surface water and sewer surcharges and rising groundwater. The LFRMS includes a Flood Risk Action Plan which identifies the practical steps that LBH and other partners need to take to reduce their risks from flooding.

[29] London Regional Flood Risk Appraisal (2018). Available at: https://www.london.gov.uk/sites/default/files/gla_migrate_files_destination/Regional%20Flood%20Risk%20Assessment%20-%20First%20Review%20-%20August%202014.pdf
[30] Environment Agency (2019) Thames Estuary 2100. Managing Flood Risk through London and the Thames estuary. TE2100 Plan. Available at: https://www.gov.uk/government/publications/thames-estuary-2100-te2100
[31] Metis (2019) London Borough of Hounslow Strategic Flood Risk Assessment Level 2. January 2019.
[32] Southwark Council (2011) Local Flood Risk Management Strategy. Available at http://www.southwark.gov.uk/environment/flood-risk-management/local-flood-risk-management-strategy

4.4.5 LBH Surface Water Management Plan

The Surface Water Management Plan[8] (SWMP) for the LBH which has been delivered as part of the Tier 2 package of works of the Drain London Project. This document is a plan which outlines the preferred surface water management strategy for the LBH and includes consideration of flooding from sewers, drains, groundwater and runoff from land, small watercourses and ditches that could occur as a result of heavy rainfall.

Direct rainfall modelling was undertaken across the entire Borough as part of the study and the results used to identify Local Flood Risk Zones (LFRZs) where flooding affects houses, businesses and/or infrastructure. Those areas identified to be at more significant risk have been delineated into Critical Drainage Areas (CDAs) representing one or several LFRZs as well as the contributing catchment area and features that influence the predicted flood extent. Within the LBH 12 CDAs have been identified.

Although not located within a CDA, the Site is located directly adjacent to CDA Group 1_034 Syon Lane Railway track, Brentford End which runs parallel with Syongate Way as it passes the Site.

5. Assessment of Flood Risk

5.1 Introduction

The NPPF requires the effects of all forms and sources of flood risk to and from the Site to be considered within a FRA. There should be demonstration of how these risks should be managed so that the development remains safe throughout its lifetime, considering current climate change predictions.

This Section discusses these potential risks in relation to tidal, fluvial, surface water runoff, groundwater and man-made/artificial sources (e.g. canals, reservoirs, pumping station failure).

5.2 Historical Flooding Incidents

Interactive mapping provided as part of the West London SFRA illustrates no records of reported historical flooding incidents within the Site boundary or in the immediate vicinity of the Site.

The 'Summary of Past Flood Maps' in the 2011 PFRA contains no records of historical flooding within the Site and the following recorded flood events in the wider locality:

- Surface water flooding event along the Great West Road, approximately 557m to the north east;
- Groundwater flooding events, approximately 1.2km to the south west near Isleworth Station and 890m to the north east in the Boston Manor/Brentford area; and
- Sewer flooding events, approximately 1.6km to the south west, near Spring Grove and 1.28km to the north east, to the east of the A3002.

No further major historical incidents are recorded on the Chronology of British Hydrological Events website[33].

5.3 Flood Map for Planning

The Environment Agency's 'Flood Map for Planning' identifies that the Site is located entirely within Flood Zone 1, defined by the National Planning Policy Framework[34] (NPPF) and the Flood Risk and Coastal Change Planning Policy Guidance[35] (PPG), as land with a low probability of flooding (<0.1% Annual Exceedance Probability (AEP)) (1 in 1000 annual probability) of river or sea flooding.

[33] University of Dundee. (2019). Chronology of British Hydrological Events. Available at: http://cbhe.hydrology.org.uk/
[34] Secretary of State for Ministry of Housing, Communities and Local Government. (2019). National Planning Policy Framework. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/733637/National_Planning_Policy_Framework_web_accessible_version.pdf
[35] Ministry of Housing, Communities and Local Government. March 2014. Planning Practice Guidance: Flood risk and coastal change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change

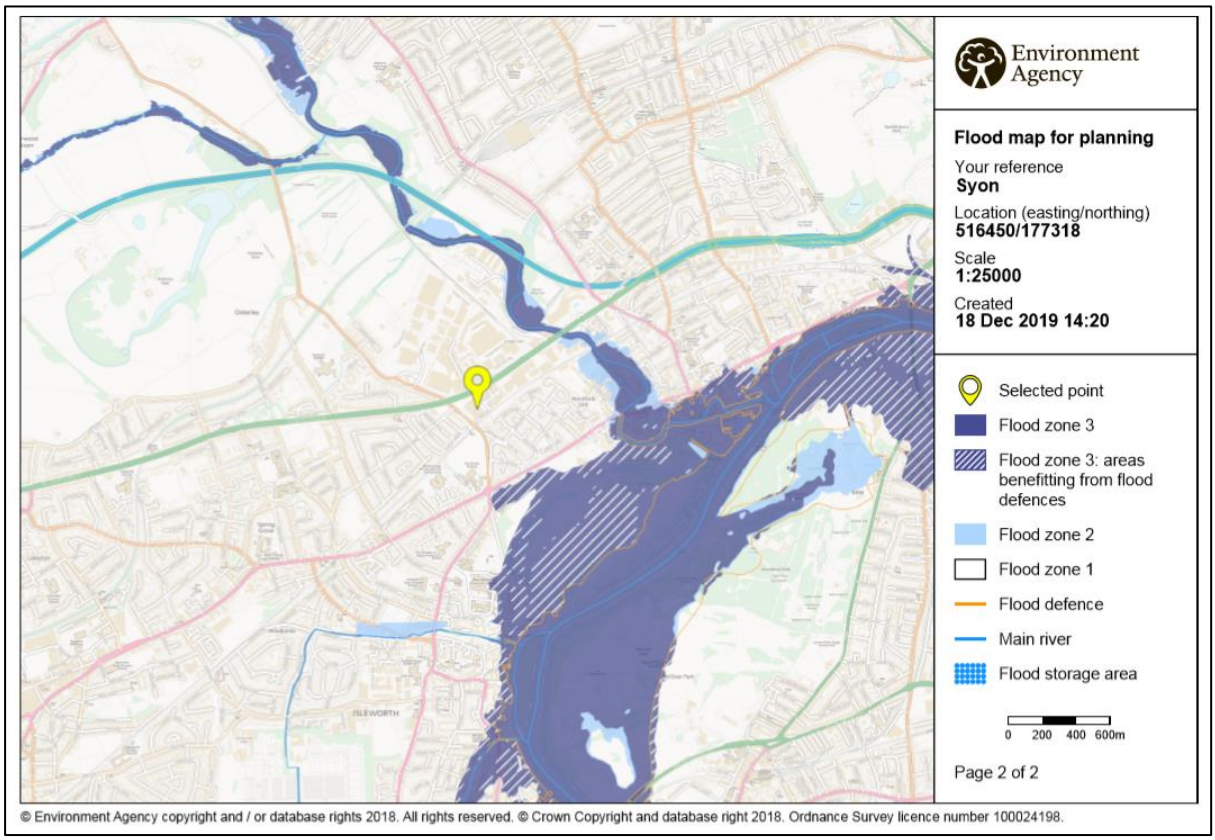


Figure 2 Environment Agency Flood Risk for Planning

The Flood Zone definitions, as presented in Table 1 of the PPG, are defined in Table 5.1 below.

Table 5.1 NPPF PPG Flood Zone Definitions

Flood Zone	Definition
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1% AEP)
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1% AEP), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5% AEP)
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1% AEP), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP)
Flood Zone 3b (functional Floodplain)	Land where water has to flow or be stored in times of flood (Not separately distinguished from Zone 3a on the Flood Map).

Source: Table 1 of the PPG[3].

5.4 Tidal Flooding

The River Thames, an EA Main river, is located approximately 1.3 km south east of the Site at its closest point and is tidally influenced in this location.

A copy of the Flood Map is provided in Figure 2. This illustrates that the Site is wholly located within Flood Zone 1 ('low' risk) defined as land having a less than 1 in 1,000 annual probability (<0.1% AEP) of sea flooding (see Table 5.1).

The Interactive West London SFRA flood maps[36] show that the Site is located outside the mapped flood extent should a breach of the flood defences along the River Thames occur, both currently and when tidal climate change allowance is applied up to and including the 2086 to 2115 epoch.

The Site is therefore assessed as being at low risk of flooding from tidal sources.

[36] https://metis.maps.arcgis.com/apps/webappviewer/index.html?id=afb73be8cbc34364ab597aeb6a615197

5.5 Fluvial Flooding

5.5.1 Main Rivers

The Grand Union Canal/ River Brent, an EA Main River is located approximately 0.7 km north east of the Site at its closest point.

A copy of the Flood Map is provided in Figure 2. This illustrates that the Site is wholly located within Flood Zone 1 ('low' risk) defined as land having a less than 1 in 1,000 annual probability (<0.1% AEP) of fluvial flooding (see Table 5.1).

The Interactive West London SFRA flood maps[37] show that the Site is at low risk of fluvial flooding, both currently and when a 70% climate change allowance is applied.

The Site is therefore assessed as being at low risk of flooding from fluvial (Main River) sources.

5.5.2 Minor Watercourses/ Water Features

The minor watercourses and water features located in the wider locality of the Site are summarised in Section 2.5. Given the distance from the Site and the intervening topography the risk of flooding from these features is assessed as low. Any flooding that does occur is likely to be shallow in depth and will remain local to the water feature.

The Site is therefore assessed as being at low risk of flooding from fluvial (Minor watercourses and water features) sources.

5.6 Surface Water (Pluvial Flooding)

Overland flow results from rainfall that fails to infiltrate the surface and travels over the ground surface; this is exacerbated where the permeability of the ground is low due to the type of soil and geology (such as clayey soils) or urban development with impermeable surfaces.

The EA 'Flood Risk from Surface Water' maps, available on the EA website[38] and presented as Figure 3, indicate areas at risk from surface water flooding, when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead lies on or flows over the ground.

The maps delineate risk into the four following categories:

- Very Low - each year, this area has a chance of flooding of less than 1 in 1,000 (<0.1 %);
- Low - each year, this area has a chance of flooding of between 1 in 1,000 (0.1 %) and 1 in 100 (1 %);
- Medium - each year, this area has a chance of flooding of between 1 in 100 (1 %) and 1 in 30 (3.3 %); and
- High - each year, this area has a chance of flooding of greater than 1 in 30 (3.3 %).

EA mapping indicates that the majority of the Site and the immediate surrounding area is at very low risk (<0.1% AEP event) of flooding from surface water. As noted in Table 5.2 below, to the south east corner of the Site, surface water is shown to pond around the existing buildings on the Site to a depth of less than 300mm. This is likely due to topographic depressions within the Site where surface water collects during storm events. Post development, following levelling of the Site, this isolated area of surface water flooding will not be present.

[37] https://metis.maps.arcgis.com/apps/webappviewer/index.html?id=afb73be8cbc34364ab597aeb6a615197
[38] https://flood-warning-information.service.gov.uk/long-term-flood-risk/#x=357683&y=355134&scale=2

Figure 3 Environment Agency Risk of Flooding from Surface Water

There are no identified surface water runoff routes to the Site from land in the surrounding area. Surface water flooding on land surrounding the Site, as identified in Table 5.2 appears susceptible to surface water flooding at medium to high return period events; however, surface water remains within the road and rail corridors and does not enter the Site.

Table 5.2 Areas at Risk from Surface Water Flooding

Risk of Flooding	Location	Depth of Flooding
Low	• Across the Great West Road to the north of the Site and Subway to the north west; • Within the railway line cutting corridor to the south of the Site. • To the south east corner of the Site where surface water is shown to pond around the existing buildings on the Site (likely due to topographic depressions); • Along Syon Gate Way, to the south east of the Site; and • On Syon Lane, adjacent to the Site to the west.	Over 900mm Below 300mm
Medium	• Across the Great West Road to the north of the Site and Subway to the north west; • Within the railway line cutting corridor to the south of the Site; and • On Syon Lane, adjacent to the Site to the west.	Over 900mm 300 – 900mm Below 300mm
High	• Across the Great West Road to the north of the Site and Subway to the north west; and • Within the railway line cutting corridor to the south of the Site.	Over 900mm 300 – 900mm

Source: EA 'Flood Risk from Surface Water' maps

As summarised in Section 4.4.5 the Site is located directly adjacent to a CDA (CDA Group 1_034 Syon Lane Railway track, Brentford End) Direct rainfall modelling was undertaken across the entire Borough as part of the study and the results used to identify Local Flood Risk Zones (LFRZs) where flooding affects houses, businesses and/or infrastructure. Those areas identified to be at more significant risk have been delineated into Critical

Drainage Areas (CDAs) representing one or several LFRZs as well as the contributing catchment area and features that influence the predicted flood extent. Within the LBH 12 CDAs have been identified.

As summarised in Section 4.4.5 the Site itself is not located within a CDA, however the Site is located directly adjacent to CDA Group 1_034 Syon Lane Railway track, Brentford End which runs parallel with Syongate Way to the south, as it passes the Site.

Surface water flooding to the Site from surrounding land and from the Site to surrounding is currently considered a 'low to medium' risk.

Climate change must be taken into account when considering surface water runoff generated by development sites. This is usually represented by increasing the peak rainfall intensities. An increase in intensity will increase surface water rates and volumes. Additional surface water drainage will be required to allow increased surface water to be contained and managed.

The conceptual drainage strategy for surface water management on the Site has included a precautionary measure of a 40% increase in peak rainfall intensities, summarised in Section 6. As a result, surface water runoff increasing over the lifetime of the development as a result of climate change is expected to be managed and not increase flood risk to the Site or elsewhere.

5.7 Groundwater Flooding

Groundwater flooding can occur when groundwater levels rise above ground surface levels. The underlying geology has a major influence on where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers).

The West London SFRA states that severe weather events in 2014 resulted in a number of groundwater flooding events across London. As summarised in Section 4.2 historical groundwater records show flooding occurred from groundwater sources approximately 1.2km to the south west near Isleworth Station and 890m to the north east in the Boston Manor/Brentford area. There are no documented groundwater flood events at the Site or near the Site red line boundary.

The EA's 'Areas Susceptible to Groundwater Flooding' (AStGWF) map is illustrated in the West London SFRA. The map is divided into 1 km^2 grid-squares and information is displayed as the proportion of each 1km^2 grid square that has potential for groundwater emergence and is split into four categories (<25%, 25%-50%, 50%-75% and >75%). The AStGWF map illustrates that the Site lies within a 1 km^2 grid square of which >= 25% <50% of the area is considered to potentially be at risk of groundwater emergence. This area is deemed as having a low to medium risk from groundwater flooding due to the nature of the local geological deposits.

Section 2.8 summarises groundwater levels recorded at the Site in November 2018 as part of the Geo-Environmental Assessment. This shows groundwater was recorded between 2.43m bgl and 2.7m bgl to the north of the Site, whilst groundwater recorded at approximately 0.9m bgl to 0.95m bgl indicates the presence of perched groundwater in the Made Ground strata.

Based on the above data the risk of groundwater flooding to the Site is considered low to medium. However, as the Proposed Development comprises basement levels within the Made Ground and Taplow Gravel strata where groundwater is recorded as present, mitigation measures will be required to reduce the risk of groundwater flooding to underground structures.

5.8 Flooding from Drainage Infrastructure

Sewer and surface water flooding are often interconnected; insufficient drainage capacity in the sewer network can result in extensive surface water flooding and, by the same rationale, large volumes of surface water can overload the public sewers, causing the sewer network to back up, surcharge and ultimately flood.

No information was available regarding the private drainage falling within the Site at the time of preparing the report. The existing private surface water drainage system collects runoff from the buildings, hardstanding areas and gullies, which then discharges into the surrounding sewer network.

The following existing Thames Water assets are located in close proximity to the Site:

- A foul water sewer runs beneath the Great West Road to the north with a further foul water sewer located beneath Syon Lane to the west; and.
- A surface water sewer runs beneath the Great West Road to the north with a further surface water sewer located beneath Syon Lane to the west.

The West London SFRA has collated information from the TWUL DG5 Flood Register for the area, which records historic internal and external sewer flooding events. Due to data protection requirements the data has not been provided at individual property level; rather the register comprises the number of properties within four-digit postcode areas that have experienced flooding either internally or externally within the last 10 years.

It should be noted that records only appear on the DG5 register where they have been reported to TWUL, and as such they may not include all instances of sewer flooding. Furthermore, given that TWUL target these areas for maintenance and improvements, areas that experienced flooding in the past may no longer be at greatest risk of flooding in the future.

Mapping of the DG5 postcode areas, undertaken as part of the SFRA, shows the Site is located in an area with no records of sewer flooding during the documented period. It is noted that the Site is not located in an area as being at a higher risk of sewer flooding.

A Pre-development enquiry was submitted to Thames Water Ltd in October 2019 with regards to foul flows from the Proposed Development. Thames Water Ltd have confirmed that the existing foul sewer network does have sufficient capacity to accommodate the proposed foul water discharge from the proposed development.

Based on the available records and information, the Site is considered to be at low risk of flooding from drainage infrastructure.

5.9 Artificial Sources

5.9.1 Reservoirs

The Reservoir Act 1975 defines a large reservoir as one that holds over 25,000 cubic metres (m^3) of water, although this is expected to be reduced to 10,000 m^3 under a review into the safety legislation and regulation of reservoirs and is expected to be phased in by the EA once this comes into effect under the Flood and Water Management Act[39].

The EA's Flood Inundation Mapping shows that the Site is not located in an area at residual risk of flooding from a reservoir as a result of structural failure or breach.

5.9.2 Canals

As outlined in Section 2.5, the River Brent is joined from the west by the main line of the Grand Union Canal at the foot of the Hanwell flight of locks approximately 2.4 km north west of the Site. From here, the River Brent is known as the Grand Union Canal and the channel is canalised and navigable down to the River Thames, approximately 1.6 km east of the Site.

Section 4.5 indicates that the Interactive West London SFRA flood maps show that the Site is at low risk of fluvial flooding (from the Grand Union Canal/River Brent), both currently and when a 70% climate change allowance is applied.

There are no reported incidences of flooding from the Grand Union Canal in the West London SFRA or the LBH LFRMS.

It is therefore considered that artificial sources pose a low flood risk to the Site.

5.10 Summary of Flood Risks to the Site

Table 5.3 presents a summary of the flood risk to the Site from each flood risk source.

[39] Flood and Water Management Act (2010). *Chapter 29 Schedule 4- Reservoirs*. Available at: http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

Table 5.3 Summary of Key Flood Risks to the Proposed Development

Flood Risk	Risk to the Site	Notes	Mitigation Required
Tidal	Low	The Site is located in Flood Zone 1 and remains in Flood Zone 1 when relevant climate change allowances are applied for tidal and fluvial flooding.	No
Fluvial	Low		No
Surface Water	Low/ Medium	When climate change is considered surface water runoff from the Site will increase over the lifetime of the development.	Yes
Groundwater	Low/Medium	Basement/ sub-basement levels are proposed as part of the development. Groundwater was recorded within the Site between 0.9 and 2.7m bgl.	Yes
Drainage Infrastructure	Low	Recorded flood events and the TWUL DG5 register show the risk of flooding is low.	No
Artificial Sources	Low	No artificial sources are located in close proximity to the Site.	No

6. Management of Surface Water from the Site

The following outline drainage strategy considers the Proposed Development as a whole and outlines the likely impact on surface water flows across the Site.

The drainage strategy is summarised on the Design Note and associated Ground Floor and Basement Drainage Strategy drawings (prepared by Waterman Group), current at the time of writing, presented in Appendix B.

It is expected that this drainage strategy will evolve and develop further as the scheme progresses.

6.1 Existing Surface Water Runoff

The existing Site is occupied by an extensive hardstanding car park and retail store with impermeable surfacing extending to the total site area of 1.445 ha.

As the current rate of discharge is not known, the following equation has been used to estimate existing surface e water runoff rates for a range of return periods:

$$Q = 2.78 \times 50 \times Aimp$$

Where, Q = peak flow rate

Aimp = impermeable area in ha

Based on a Site area of 1.445 ha, the following return period greenfield runoff rates, presented in Table 6.1 below, have been estimated.

Table 6.1 Estimated Existing Surface Water Runoff Rates for the Site (l/s)

Return Period	Runoff Rate
QBAR	124
1 in 1 yr	1.06
1 in 30 yr	297
1 in 100 yr	388

The supporting estimation calculations are presented in Section 5A of the LBH Drainage Assessment Form in Appendix B of this report.

The Site is served by existing TWUL drainage systems in the wider surrounding area (See Appendix A) and a surface water sewer runs beneath the Great West Road to the north with a further surface water sewer located beneath Syon Lane to the west.

6.2 Policy Requirements

There are a number of national, regional, and local policy requirements which are relevant to this outline drainage strategy. These policy requirements ensure that the Proposed Development will be sustainable and can, if possible, contribute to a decreased flood risk beyond the Site in the local area. The policy requirements are outlined below and discussed in the context of the Proposed Development.

6.2.1 National Planning Policy Framework (NPPF)

The NPPF requires that the Proposed Development should not increase flood risk both on the Site and in the area surrounding it. Surface water runoff should therefore not exceed the volumes already generated by the existing Site and betterment should be achieved where possible.

6.2.2 The Building Regulations 2010

The Building Regulations 2010 Approved Document H, Drainage and Waste Disposal (2015 Edition)[40], has been issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 and Schedule 7 of the Building regulations 2010 for England and Wales.

This requires that surface water runoff be discharged according to the following discharge hierarchy:

1. Discharge to soakaway or some other adequate infiltration system;
2. Discharge to surface watercourses; or
3. Discharge to sewers.

6.2.3 The Intend to Publish London Plan

Policy SI13 Sustainable Drainage - Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks.

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 drainage hierarchy. Supplementary guidance on surface water run off rates from development sites is provided by the Sustainable Design and Construction SPG, as outlined below.

6.2.4 Supplementary Planning Guidance – Sustainable Design and Construction

- Section 3.4.8: Most developments referred to the Mayor have been able to achieve at least 50% attenuation of the undeveloped site's surface water runoff at peak times. This is the minimum expectation from development proposals;
- Section 3.4.7: If greenfield runoff rates are not proposed, developers will be expected to clearly demonstrate how all opportunities to minimise final site runoff, as close to greenfield rate as practical, have been taken;
- Section 3.4.10: All developments on greenfield sites must maintain greenfield runoff rates. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. The only exceptions to this, where greater discharge rates may be acceptable, are where a pumped discharge would be required to meet the standards or where surface water drainage is to tidal waters and therefore would be able to discharge at unrestricted rates provided unacceptable scour would not result;
- Section 3.4.14: Development should utilise SuDS unless there are practical reasons for not doing so. The aspiration is to deliver SuDS schemes that provide multiple benefits, in addition to reducing flood risk; and
- Section 3.4.15: SuDS should be fully justified by adopting techniques in a hierarchical manner, maximising the use of those techniques higher up the hierarchy and those that deliver multi-functional benefits before considering others further down the hierarchy.

Paragraph 3.4.9 of the SPG states that there may be situations where it is not appropriate to discharge at greenfield runoff rates. These include, for example, sites where the calculated greenfield runoff rate is extremely low, and the final outfall of a piped system required to achieve this would be prone to blockage. An appropriate minimum discharge rate would be 5 litres per second per outfall.

6.2.5 London Borough of Hounslow Council

LBH, as the LLFA, is the risk management authority responsible for local flood risk. The LLFA is required to provide consultation responses on the surface water drainage provisions associated with major development.

Planning applications for major development should therefore be accompanied by:

- A site-specific drainage strategy that demonstrates that the drainage scheme proposed is in compliance with LBH's sustainable drainage policies, as outlined within the LBH Local Plan[26/27]; and
- A completed LBH Drainage Assessment Form (as presented in Appendix B).

The policies relating to sustainable drainage and surface water management are summarised in Section 3.3.

[40] HM Government (2015) The Building Regulations 2010 Approved Document H, Drainage and Waste Disposal (2015 Edition)

6.2.6 Thames Water

A Pre-development enquiry was sent to TWUL for both foul and surface water discharge from the Site (see Appendix A). TWUL have confirmed that:

- The existing foul sewer network does have sufficient capacity to accommodate the proposed foul water discharge from the proposed development; and
- In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers. Only when it can be proven that that the hierarchy of disposal methods have been examined would we accept a restricted discharge of 5.0 l/s into the public surface water sewer.

6.3 Proposed Conceptual Surface Water Drainage Strategy

The proposed surface water design collects runoff from the roof of the proposed building and surrounding hard landscaped areas within the Site.

As impermeable hardstanding currently covers the majority of the Site, as a worst case scenario it has been assumed that the Site is 100% impermeable, therefore the Proposed Development will not increase the area of impermeable surfaces within the Site. Over the lifetime of the Proposed Development the surface water runoff rate and volume, with the inclusion of climate change, would increase without effective management. The proposed conceptual surface water drainage strategy demonstrates that surface water shall be effectively managed in accordance with all relevant policies. The proposed drainage strategy is described in the following subsections.

6.3.1 Allowable Discharge Rates

The NPPF requires that new development should not increase flood risk both within and outside of the Site. In the context of surface water drainage, this effectively means that surface water runoff from the Proposed Development should not exceed the runoff rates and volumes currently generated on Site.

DEFRA's Sustainable Drainage Systems NSTS sets out the requirements for the design, construction, maintenance and operation of SuDS. The NSTS that are of primary concern in relation to the drainage strategy are provided in Table 6.2.

Table 6.2 Relevant Defra SuDS Non-Statutory Technical Standards

Concern	NSTS
Peak flow control	S3 – "For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface waterbody for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.."
Volume control	S5 – "Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface waterbody in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event." S6 – "Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S5 […], the runoff volume must be discharged at a rate that does not adversely affect flood risk."
Flood risk within the development	S7 – "The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event."
	S8 – "The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development."
	S9 – "The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property."

Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

Volume Control S5 is typically only achieved for extreme rainfall events when runoff from the development can be discharged via infiltration, which is not likely to be viable for the Proposed Development. As such, it is necessary to satisfy the requirements of Volume Control S6 instead. This is typically achieved by restricting the rate of surface water discharge from the development at a controlled rate.

Additionally, in accordance with Peak Flow Control S3, the controlled rate of runoff in 100% AEP (1 in 1 year return period) events shall equate to the greenfield runoff rate for the same event.

Previous studies for proposed developments in London indicate that greenfield runoff rates for smaller development sites tend to be low, between 2-3 l/s, which is below the minimum flow rate required for flow control devices to operate and can also increase the risk of blockages within the drainage system, which in turn can increase the risk of flooding from drainage infrastructure. As a consequence, and as stated in the London Plan and the associated Sustainable Design and Construction SPG, a restricted surface water discharge rate of 5 l/s (a rounded-up greenfield runoff rate based on HR Wallingford advise to avoid blockages) can be used as an allowable discharge rate for surface water from the Site.

6.3.2 Greenfield Runoff Rate

The HR Wallingford Online Greenfield Runoff Estimation Tool[41] has been used to estimate the potential greenfield runoff rate limits for the Site, in line with EA guidance[42] and the SUDS Manual.

Based on a Site area of 1.445 ha, the following return period greenfield runoff rates, presented in Table 6.3 below, have been estimated. The supporting estimation calculations are presented in Section 5A of the LBH Drainage Assessment Form in Appendix B of this report.

Table 6.3 Estimated Greenfield Runoff Rates for the Site (l/s)

Return Period	Greenfield Runoff Rate
QBAR	2.22
1 in 1 yr	1.88
1 in 30 yr	5.10
1 in 100 yr	7.07

The Q-bar greenfield run-off rate for the Site has been calculated as 2.22 l/s based on modelling undertaken using the HR Wallingford online tool.

Section 3.4.10 of the Sustainable Design and Construction SPG states that on previously developed sites, runoff rates should not be more than three times the calculated greenfield rate which, based on the estimated QBAR, is equivalent to 6.66 l/s.

Given that the estimated QBAR greenfield run off rate is below the minimum flow rate required for flow control devices to operate efficiently and to prevent blockages in the drainage system, it is proposed to discharge surface water runoff from the Site at a rate of 5 l/s (a rounded up greenfield runoff rate based on HR Wallingford advice to allow operation of flow control devices and avoid blockages). This proposed rate is below the three times the calculated greenfield rate (as outlined above) and in line with the Sustainable Design and Construction SPG.

The proposed restricted 5 l/s discharge rate will reduce the runoff rate from the Site, by 95% in the 1-year storm event and up to 98.7% in the 100-year storm event. when compared to the existing scenario

It is proposed that discharge from the Site would be to Thames Water public sewer assets at 5 l/s, as outlined in the Thames Water Pre-development enquiry response (Appendix A).

[41] https://www.uksuds.com
[42] http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/Rainfall_Runoff_Management_for_Developments_-_Revision_E.sflb.ashx

6.3.3 Discharge Hierarchy

The drainage hierarchy is outlined in the London Plan Sustainable Design and Construction SPG and summarised in Table 4.7. The aim of Hierarchy of Drainage is to drain surface water run-off as sustainable, as reasonably practicable.

As stated in the PPG, the aim should be to discharge surface water run-off as high up the drainage hierarchy, 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; or
4. to a combined sewer.

As summarised in Table 6.4 below, infiltration based drainage methods cannot be used across the Site due to the presence of made ground, a high water table and land take requirements. There are no local surface waterbodies in close proximity to the Site in which to discharge surface water runoff. Therefore, the TWUL drainage in the area, comprising separate surface water and foul water sewers rather than combined systems, is considered to be the preferable option for the Site.

6.3.3.1 SuDS Hierarchy

Section 3.4.15 of the London Plan Sustainable Design and Construction SPG states "*SuDS should be fully justified by adopting techniques in a hierarchical manner, maximising the use of those techniques hierarchy before considering others further down the hierarchy*".

The SuDS Hierarchy is presented in Table 4.7 in Section 4.2.3. Table 6.4 below considers the SuDS Hierarchy and provides justification for the application of the chosen SuDS methods that will be applied for the Proposed Development.

Development proposals include, where possible, planters, tree pits and communal podium gardens for residents.

Table 6.4 Use of the SuDS Hierarchy on-site

SuDS Technique	Primary Use	Description	Used on the Site	Justification
Living Roofs	Source Control	A planted soil layer is constructed on the roof of a building to create a living surface. Rainwater is taken up by evapotranspiration; excess is treated as it slowly percolates through the medium before being released to the drainage system at a controlled rate.	Yes	Applications of green/ brown roofs are ideal for use on flat or gently sloping roofs to commercial buildings and therefore suited to urban city centre settings where there is limited space for other SuDS techniques. Living roofs help to control surface water runoff and can be allowed for in sizing SUDS. Generally living roofs can attenuate storms up to a 50% AEP event (1 in 2-year return period). Green/ brown roofs will be utilised across the Site, where possible.
Basins and Ponds • Constructed wetland • Detention basins • Retention ponds (Balancing ponds)	Source Control, Attenuation (& Treatment (Wetlands only)	Wetlands provide both stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered almost entirely in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle, and to remove contaminates by facilitating adhesion to vegetation and aerobic decomposition. They also provide significant ecological benefits Retention ponds (or balancing ponds) are open areas of shallow water, designed so they can accommodate rainfall and provide temporary storage for excess water. The water level rises temporarily when it rains, but there is always a permanent pool of water. They are similar to wetlands, but they are more useful for storing excess water. The design of retention ponds permanently storing water is what differentiates from detention basins. Detention basins (or ponds) are open, usually flat areas of grass that are normally dry, except after major storm events. In heavy rainfall they are used to store water for a short time and so they can fill with water. These can be designed to be multifunctional. Effective operation requires that sediment and debris is removed upstream.	No	Basins and ponds require a large area which reduces their applicability in urban areas and wet ponds need a large enough catchment to maintain a permanent pool. Given the limited space available (the development comprises a large retail store at ground floor with the building footprint and car parking provision taking up the majority of the site area, with public highways surrounding the development), the required storage volumes, and small catchment area, basins and ponds were not considered to be feasible. In addition, the nature of the Proposed Development, surrounding road network, basement level, presence of Made Ground, and possible perched groundwater, suggest that basins and ponds are not practical at this Site.
Swales	Conveyance, Treatment & Attenuation	Swales are shallow open channels designed to capture, convey, treat and attenuate surface water runoff. With appropriate planting, they can enhance the natural landscape and provide aesthetic and biodiversity benefits. They can be lined, or unlined to allow infiltration.	No	Made ground is present across the Site (see Infiltration Devices below) and therefore negates the use of infiltration-based drainage methods.

SuDS Technique	Primary Use	Description	Used on the Site	Justification
Filter Strips	Conveyance, Treatment & Attenuation	Filter drains are shallow trenches filled with gravel, providing attenuation, conveyance and treatment.		Swales and filter strips are more likely to be incorporated into landscape and public open spaces, as they tend to demand significant land take (due to their shallow side slopes (swales) and width of runoff area required (filter strips) and are not usually practical on very flat site. Swales and filter strips are therefore generally difficult to incorporate into dense urban development's where space is limited, as with the Site. As the open areas within the Site will be predominantly used for car parking provision for the Tesco store and residential parking, there is no suitable public open green space available in the Proposed Development that provides a sufficient area to incorporate swales and/ or filter strips. Landscaping comprises predominantly communal podium gardens for residents. Filter strips can only be used to treat very small drainage areas. For a flow path longer than 23 m, flow over impervious surfaces changes from sheet flow to concentrated flow. Once flow is concentrated, the velocities are too great for filtration to be effective. The Site provides parking provision for the Tesco store and residential development with surface drainage areas greater than 23m in length, therefore filter strips are not used on Site.

SuDS Technique	Primary Use	Description	Used on the Site	Justification
Infiltration Devices - Infiltration trenches and basins	Source Control & Attenuation.	Infiltration devices involve landscaped depressions which capture and temporarily allow runoff to pond on the surface, before filtering through vegetation and underlying soils prior to collection.	No	The LBH Drainage Assessment Form states[43]: • *'infiltration rates are highly variable and infiltrating into made (i.e. unnatural) ground should be avoided'; and* • *'a minimum of 1m depth between the base of the infiltration device and the water table is required to protect groundwater quality and ensure groundwater does not enter infiltration devices. Avoid infiltration where this is not possible'.* Ground conditions beneath the Site are assessed in the Geo-Environmental Assessment (summarised in Section 2.7) which indicates that Made Ground is present on the Site to a depth of 2m bgl. Made Ground is underlain by the Taplow Gravel Member with an estimated thickness of 3m. Although the underlying geology has moderate infiltration potential, groundwater levels reported at the Site (see Section 2.8) show groundwater is present at a depth of between 0.9 and 2.7m bgl within the Made Ground and Taplow Gravel strata negating the use of infiltration-based drainage methods at the Site.
Infiltration Devices - Soakaways		Soakaways store runoff from a single house or from a development and allow its efficient infiltration into the surrounding soil. A soakaway will allow water to soak through the surface into the gravel sub-base below, temporarily holding water before allowing it to either soak into the ground or to an outfall.		
Permeable surfaces and filter drains • Gravelled areas • Solid Paving blocks • Porous pavers	Source Control & Attenuation	Runoff is allowed to percolate through a permeable surface, which may be paved (as in pervious paving) or unpaved (as in a filter strip). Water is treated as it filters into the sub-base, where it may be attenuated and conveyed to the drainage network.	No	If infiltration-based methods are required, groundwater must be at least 1 m below the base of the construction (and possibly greater). In addition, unlined permeable surfaces should not be used in locations where infiltrating water may cause slope stability or foundation problems (e.g. close to building foundations, basement levels etc). Made ground is present across the Site (see Infiltration Devices above) with potentially

[43] Available at: https://www.hounslow.gov.uk/downloads/file/662/drainage_assessment_form

SuDS Technique	Primary Use	Description	Used on the Site	Justification
				perched groundwater levels of 0.9m bgl therefore negates the use of infiltration-based drainage methods. If infiltration is not required, the highest groundwater level should be below the base of the pavement structure. In addition, a membrane may be required to protect weak subgrades or prevent infiltration which, depending on the required area, incurs a significant cost. Non-infiltration type pervious paving is therefore not considered suitable at the development due to the presence of the underlying basement level, the depth of paving required to provide the required storage volumes in relation to the underlying groundwater levels and cost incurred.
Tanked systems • Oversized pipes/tanks • Box Storage systems	Attenuation	Below-ground void spaces can be used to temporarily attenuate runoff. The void space can be constructed using geocellular or other modular storage system, precast concrete tanks or large-diameter pipes. These systems do not provide the multiuse benefits achieved through other SuDS components, and so are not preferred.	Yes	Online and offline tanked storage is considered suitable where there is limited space within a development. Tanked storage is a conventional method that is well understood both in design and construction terms, does not take up large amounts of site area, and can be located under most areas of a site. Tanked storage/ oversized pipes are considered appropriate at the development due to the dense urban nature of both the Site and surrounding area, therefore the scope for using other SuDS techniques may be limited, as outlined in the Table above. The tanked/ oversized pipes attenuation system is to be installed below the Tesco store.

6.3.3.2 Points of Discharge

As infiltration drainage is unlikely to be viable (due to the presence of made ground and a high water table) and there are no local watercourses in proximity to the Site, discharge to sewer will be required. The surrounding TWUL surface water drainage infrastructure provides opportunities for this method of discharge.

It is proposed that surface water runoff from the Site will discharge at the restricted rate of 5l/s (as recommended by TWUL in their pre-development response, see Appendix A) to the surface water sewer (manhole TW3253) located in Syon Lane to the west of the Proposed Development (shown on the Ground Level Drainage Strategy drawing in Appendix B).

6.3.4 Surface Water Attenuation Volumes

The required attenuation storage for the 1% AEP (1 in 100 years), in which any flooding must be managed within the Site, has been calculated using MicroDrainage 'Quick Storage Estimate' software based on the Site being 100% impermeable and the maximum allowable discharge rate (5l/s). A standard safety factor has been included in the calculations in addition to a 40% increase in rainfall intensity due to climate change. The outputs of the process are given as a range, of which the maximum has been taken to express the required storage volume at this stage. The attenuation storage required for the Site is approximately 1,400m^3.

Attenuation storage will be provided within the Site via Turbosider large diameter corrugated steel pipes, the diameter of which will be determined when foundation details become available, and a Hydro-Brake for gradual release into the TWUL surface water sewer located in Syon Lane. The attenuation is to be installed below the Tesco store due to the lack of space within external areas. Tubosider pipes are proposed rather than conventional geocellular crates due to the complex arrangement of the attenuation around the building's pile caps.

The proposed attenuation volume ensures no flooding occurs in the critical 1:30 year storm event and no flooding of the building occurs in the critical 1:100 year storm event, in line with TWUL and EA guidelines.

6.4 Pollution Control

Treatment should be provided as far upstream in the drainage system as possible. This protects the drainage system downstream from contamination, clogging and blockage, and aids the identification of any residual contamination sources.

Where a sufficient SuDS train is not feasible, proprietary treatment systems, such as oil interceptors, are to be utilised.

6.5 Maintenance and Operation

The drainage system will either be adopted, or a maintenance company will be set up to manage its upkeep, this will be decided at the detailed design stage.

Table 6.6 below details the typical life and maintenance requirements of components within the surface water drainage system.

Table 6.5 Conventional Drainage Systems: Life and Maintenance Requirements

Element Type	Element	Description	Normal Life Expectancy	Maintenance Requirements
Drainage	Surface water design		30+ years	Flushing out as necessary. Sewers to be checked at manholes every 1 year. Any problems from this inspection may require CCTV survey.
	Manholes	Precast concrete manholes	30+ years	Covers may need resetting if surfacing renewed.
		Brick manholes	30+ years	Covers may need resetting if surfacing renewed.
		Plastic manholes	30+ years	Covers may need resetting if surfacing renewed.
	Gullies	Precast concrete gullies	30+ years	Gully empty and flush required twice per year. Allow for 25% covers to be reset. Pitting out required

Element Type	Element	Description	Normal Life Expectancy	Maintenance Requirements
				occasionally (allow each gully to be pitted out once during 30 years).
		Plastic gullies	30+ years	Gully empty and flush required twice per year. Allow for 25% covers to be reset. Pitting out required occasionally (allow each gully to be pitted out once during 30 years).
	Drainage channels	Max E Channels	30+ years	Flush twice per year.
		ACO Drainage Channels	30+ years	Flush twice per year.
	Catchpits	Precast concrete catchpits	30+ years	Covers may need resetting if surfacing renewed.
	Interceptors			Inspect and clean out every 6 months
SUDS	Storm attenuation – oversize pipes		30+ years	Inspect annually. Clean out every 5 years.
	Storm attenuation – Proprietary Systems e.g. Versavoid		30+ years	Inspect and flush out annually.
	Flow Control Devices	Hydrobake	30+ years	Clean out annually.
	Pipes	Concrete pipes	30+ years	Inspect manholes annually or if problems occur. Allow for flushing every 5 years.
		Clayware pipes	30+ years	Inspect manholes annually or if problems occur. Allow for flushing every 5 years.
		Plastic	30+ years	Inspect manholes annually or if problems occur. Allow for flushing every 5 years.
		Land drains	30+ years	Clean out silt chambers annually.

The large diameter pipework for attenuation underneath the Tesco store will be accessed for inspection/ maintenance via access chambers which will be located at the back of house section of the store and on the access ramp to the carpark. Any foul or surface water droppers will be located within the store would be rod-able via an access point located on the riser.

7. Mitigation Measures

Consideration should be given to measures that protect the Proposed Development from the residual risk of flooding in the event that heavy rainfall that could result in surface water flooding at the site if the design capacity of the drainage network is exceeded.

7.1 Groundwater

Basement/sub-basement levels are proposed across the Site within the Made Ground and Taplow Gravel Formation. There is potential that the structure may come into contact with underlying groundwater within these strata.

It is proposed to follow the British Standard 8102[44] (BS8102) recommendations which state that basements with a depth greater than 4m should be designed to allow for fluctuations in the water table of up to 1m below ground level. BS8102 offers guidance for the design and waterproofing of basements and defines 3 grades as follows:

- *Grade 1: Basic Utility*. Car parking, plant rooms (excluding electrical equipment), workshops. Some seepage and damp patches tolerable, dependent on the intended use;
- *Grade 2: Better Utility*. Plant rooms and workshops requiring drier environments (than Grade 1); storage areas. No water penetration acceptable. Damp areas tolerable; ventilation might be required; and
- *Grade 3: Habitable*. Ventilated residential and commercial areas including offices, restaurants etc., leisure centres. No water penetration acceptable. Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use.

The risk from groundwater flooding to basement structures can therefore be mitigated by designing the basement to the appropriate grade which is suitable for the proposed uses of the basement level.

During construction, the basement walls will have to provide a cut off to groundwater and, in the permanent conditions; the basement structure will form an impermeable box that will obstruct the current groundwater across the Site.

This barrier to the groundwater flow would be expected to be only local. However, given the potential presence of localised groundwater flows (groundwater was encountered on-site at between 0.9m and 2.7m bgl within the Made Ground and Taplow Gravel Formation), it is recommended that any potential impact on adjacent properties is mitigated by implementing drainage measures, where required, to ensure that the ground outside the basement remains well drained. Provided that an adequate drainage system is implemented, the basement/sub-basement levels are not expected to have adverse impact on the surrounding properties.

The risk of wet areas forming behind the walls could be mitigated by the provision of a perimeter drainage system around the basement that allows the re-establishment of the natural groundwater flow down-slope.

7.2 Drainage System Failure, Capacity Exceedance and Maintenance

Following the completion of the Proposed Development, an additional residual risk relates to maintenance of the on-site drainage infrastructure. Failure, blockage and capacity exceedance above that of the design events for the drainage system are a potential risk to the Site and the surrounding area.

In order to reduce the risks, maintenance of the system will be incorporated in general site management and will be the responsibility of the LLFA or site management company (i.e. whoever adopts the drainage). A general list of maintenance requirements and associated timescales are presented in Table 6.6 in Section 6.5 of this report. A manual will be prepared detailing each drainage feature on site, the maintenance required, timescales for maintenance and who is responsible for undertaking the maintenance. It is expected the Site owners will ultimately be responsible for maintenance of the site drainage system including all pipes, discharge structures and any SuDS implemented on site in accordance with the recommendations in the SuDS Manual.

CIRIA C635[45] provides guidance on measures that can be incorporated into the detailed design of developments to steer surface water that has exceeded the capacity of the drainage system away from buildings and route it towards the intended point of attenuation and discharge (for example along swales and roads using raised kerbing and through parking areas).

[44] British Standards Institute (2009) Code of Practice for Protection of Below Ground Structures against Water from the Ground
[45] Balmforth et al.(2006) Designing for Exceedance in Urban Drainage – Good Practice (CIRIA 635)

8. Post-Development Impacts and Residual Risk

8.1 Post Development Impacts

As the Proposed Development is located outside of the 1% AEP with climate change allowance flood extents there will be no negative impact on tidal or fluvial flood risk, either at the Site or the wider area.

The conceptual surface water drainage strategy outlined in Section 5 shows that the Proposed Development will not increase the area of impermeable surfaces within the Site. However, when climate change is considered over the lifetime of the development, the post-development runoff rate and volume would increase without effective management.

The proposed conceptual surface water drainage strategy demonstrates that surface water shall be effectively managed in accordance with all relevant policies and is not considered likely to increase surface water flows at the Site or downstream. The proposed drainage arrangements are such that the development will not lead to an increase in runoff entering the local sewer system and therefore no increase in downstream flood risk. As such there will be no negative impact on the sewerage, drainage or surface water land drain networks as a result of the development.

8.2 Residual Risk

8.2.1 Identified Risks

The following residual risks have been identified over the lifetime of the development:

- Failure, blockage and exceedance of design events for the drainage system are a potential risk to the Site and the surrounding area.
- The risk of blockage or other failure of the site foul drainage system (pumps, non-return valves), as well as exceedance of its standard of design; and
- The conceptual surface water drainage strategy provides storage for up to and including the 1% AEP storm event with a 40% allowance for climate change however, if a storm event was to occur that exceeds this capacity flooding from the drainage system would occur.

8.2.2 Management of Risk

Regular maintenance of the drainage system should be undertaken to ensure that the system continues to perform as designed. In order to reduce the risks, maintenance of the system will be incorporated in general site management and will be the responsibility of the LLFA or private site management company (i.e. whoever adopts the Site drainage). A manual will be prepared detailing each drainage feature on site, the maintenance required, timescales for maintenance and who is responsible for undertaking the maintenance. It is expected the Site owners will ultimately be responsible for maintenance of the site drainage system including all pipes, discharge structures and any SuDS implemented on site in accordance with the recommendations in the SuDS Manual.

CIRIA C635[46] provides guidance on measures that can be incorporated into the detailed design of developments to steer surface water that has exceeded the capacity of the drainage system away from buildings and route it towards the intended point of attenuation and discharge (for example along swales and roads using raised kerbing and through parking areas).

Minimum finished floor levels of approximately 300mm above surrounding ground level, where possible, will provide further mitigation against residual risk from exceedance events.

[46] Balmforth D, Digman C, Kellagher R, Butler D (2006), Designing for Exceedance in Urban drainage – Good practice, (CIRIA 635)

9. Summary and Conclusions

9.1 Flood Risk Summary

9.1.1 Tidal Sources

Based on the EA Flood Map for Planning, it has been determined that during the existing scenario the Site is at a 'low' risk of flooding from tidal sources (River Thames) resulting from overtopping of the defences during events that exceed a 0.5% AEP (1 in 200 chance) of flooding.

During a future scenario resulting from climate change up to 2125 the Site remains at 'low' risk of flooding as a result of the defences overtopping during events that exceed a 0.5% AEP (1 in 200 chance) of flooding, or in the event that the defences were to breach during either the 0.5% or 0.1% AEP (1 in 1000 chance) events.

Appropriate mitigation measures are therefore not required to be implemented at the Site to mitigate this risk.

9.1.2 Fluvial Sources

The information provided by the EA Flood Map for Planning identifies the Proposed Development to be at 'low' risk of fluvial flooding from the River Brent and the Grand Union Canal.

During a future scenario resulting from climate change up to 2115 the Site remains at 'low' risk of fluvial flooding therefore appropriate mitigation measures are not required to be implemented at the Site to mitigate this risk.

9.1.3 Surface Water Runoff to the Site

The risk of surface water flooding within the Site from elsewhere or generated within the Site is considered to be ' low to medium'.

9.1.4 Groundwater

The risk of groundwater flooding within the Site is considered to be 'low' to 'medium'. However, as the Proposed Development comprises basement levels within the Made Ground and Taplow Gravel strata where groundwater is recorded as present, mitigation measures, including those outlined in British Standard 8102 (BS8102) will be required to reduce the risk of groundwater flooding to underground structures.

9.1.5 Artificial Sources

There are no artificial sources of flood risk, such as lakes or reservoirs in close proximity to the Site (the Grand Union Canal has been assessed under fluvial flooding). It is therefore considered that there are no flood risks posed to the Site from these sources and no mitigation is required.

9.2 Management of Surface Water Runoff from the Site

In order to ensure that the development does not increase the flood risk elsewhere, surface water discharge from the Site will be restricted to 5l/s in accordance with the requirements of the London Plan and the associated Sustainable Design and Construction SPG. Surface water runoff attenuation will be provided to ensure the restricted runoff rate runoff rate is maintained up to the 1% AEP event plus a 40% allowance for climate change.

Following the application of the drainage and SuDS hierarchy it is proposed that surface water attenuation in the form of living roofs, where possible, and oversized pipes will be provided within the Site. It is proposed that the discharge rates from the attenuation storage will be controlled by the use of a HydroBrake feature and released into the existing drainage infrastructure surrounding the Site. Water will then continue to follow the existing drainage mechanism.

The detailed drainage design will confirm the storage volumes required once the exact impermeable area of the proposed land use is confirmed.

9.3 Residual Risk Mitigation Measures

A number of additional mitigation strategies will be considered during the design process for the Proposed Development to ensure the operation of Site is maintained in the event of a flood. These strategies include, providing flood resistance and resilience measures into the design of the buildings (i.e. minimum floor levels) and designing for failure, maintenance and capacity exceedance of the surface water drainage network.

Appendix A Thames Water Consultation Response

Pre-planning enquiry

Application form

Please complete this form and return it to us at
developer.services@thameswater.co.uk or
Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, RG1 8DB.

Thames Water

Application for a pre-planning enquiry

Please complete ALL relevant sections of this form in BLOCK CAPITALS

Use this form to find out if there's existing capacity in our network for your proposed development. Please ensure you complete the form in full and we'll respond within 21 calendar days from receipt of your completed application form. We'll let you know if sufficient capacity already exists in the network or if further modelling will be needed to determine if network adjustments or reinforcement will be required.

Is your application for: Water and sewerage ☐ Water ☐ Sewerage ☐ (Please tick one.)

If your site will require a new main, is a budget estimate required? Yes ☐ No ☐

If your site requires service connections off an existing main, while we do not offer a budget estimate service for this, you're able to estimate this yourself online at **thameswater.co.uk/newconnectioncharging**

Section A - About you

(i) Details of applicant

Company name WATERMAN GROUP

Developer ☐ Consultant ☐ Land promoter ☐ SLP ☐ NAV ☐ Other ☐

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr ☐ Other ☐

First name(s) CURTIS

Last name BLAIR

Preferred phone no. 02079287888

Alternative phone no.

Email address curtis.blair@watermangroup.com

Full postal address

Address line 1 PICKFORDS WHARF

Address line 2 CLINK STREET

Town LONDON

County LONDON Postcode SE1 9DG

(ii) Who should we contact to discuss the application?

Applicant ☐ Nominated contact ☐ (Please tick one.)

If nominated contact:

Company name

Developer ☐ Consultant ☐ Land promoter ☐ SLP ☐ NAV ☐ Other ☐

Title Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr ☐ Other ☐

First name(s)

Continued...

Last name		
Preferred phone no.		
Alternative phone no.		
Email address		
Full postal address	Address line 1	
	Address line 2	
	Town	
	County	Postcode

Section B - About the site

(i) Your site address

Same as applicant ☐ Same as nominated contact ☐ At another location ☐ (Please tick one.)

If another location:

Site name	SYON LANE	
Full postal address	Address line 1	18 SYON LANE
	Address line 2	BRENTFORD
	Town	ISLEWORTH
	County	HOUNSLOW Postcode TW7 5QE

Does the developer own the site? Yes ☐ No ☐ Don't know ☐

What is the local authority? HOUNSLOW COUNCIL

Ordnance Survey grid ref TQ 16420 77340

Type of site Greenfield ☐ Brownfield ☐ Mixed ☐

How big is the site? 1.445 hectares

(ii) Your planning status (If you've already started the planning process).

Is the development identified in the local plan? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does it have outline planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does it have full planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does the development have building regulations permission? Yes ☐ No ☐ Don't know ☐

(iii) Your development

To enable us to determine whether the capacity is sufficient or whether further modelling and reinforcement of our network will be required please provide details of the properties currently existing on the site (where applicable) and how you will phase your development. The information you provide at this stage will help improve the accuracy of our assessment. If you have more than 6 phases for your development please add details on a separate sheet.

		Proposed site						
Property type	**Existing site**	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**	**Phase 5**	**Phase 6**	**Total**
Start on site date								
Date of Occupation								
General housing (total units)								
Flat (total units)	0	497						
Primary school (max. pupil capacity)								
Secondary school (max. pupil capacity)								
Boarding school (max. pupil capacity)								
Assembly hall (max. capacity)								
Cinema (max. capacity)								
Theatre (max. capacity)								
Sports hall (max. capacity)								
Hotel (total bedrooms)								
Guest house (total bedrooms)								
Motel (total bedrooms)								
Holiday apartment (total capacity)								
Leisure park (max. capacity)								
Caravan park standard (total spaces)								
Caravan site standard (total spaces)								
Camping site standard (total spaces)								
Camping site serviced (total spaces)								
Student accommodation (max. capacity)								
Public house (max. capacity)								
Restaurant / Day care centre (max. capacity)								
Drive in restaurant (max. capacity)								
Hospital (total beds)								
Nursing / Care home (total beds)								
Offices (gross internal area in m^2)								
Shopping centre (gross internal area in m^2)								
Warehouse (gross internal area in m^2)								
Commercial premises (gross internal area in m^2)	4180	10800						
Manufacturing unit (gross internal area in m^2)								
Other (please state units and description)								

Section C - About the water supply
(Not required if only applying for sewerage connection).

(i) Phasing water supply for your development

If you already have a plan for the phasing of your development please give details below.

Property type	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Date water connection required						
Estimated peak clean water flow rate (litre/sec)						
Break tank capacity, if any (m^3)						

If you're using a break tank please advise what measures you plan to take to avoid high peak flow over a short period of time.

Section D - About your sewerage connections
(Not required if only applying for water connection).

(i) Your existing sewerage connections (brownfield site only).

Please give us details of your existing connections.

	Foul water	Surface water
Does the site have the following sewerage connections?	☐	☐
What is the type of discharge method?	☐ Gravity	☐ Gravity
	☐ Pumped	☐ Pumped
If sewage is pumped, what is the pump rate?	litres/sec	litres/sec
What is the existing impermeable area per connection?		m^2
What are the existing connection points? (For example, 'X' properties to TW manhole ref 'Y')	UNKNOWN, PENDING DRAINAGE SURVEY	UNKNOWN, PENDING DRAINAGE SURVEY

(ii) Your proposed sewerage connections

Please give us details of your proposed connections.

	Foul water	Surface water
Does the site have the following sewerage connections?	☐	☐
What is the type of discharge method?	☐ Gravity	☐ Gravity
	☐ Pumped	☐ Pumped
If sewage is pumped, what is the pump rate?	☐ litres/sec	☐ litres/sec
What is your proposed approach to surface water drainage?		☐ Sustainable drainage system (SuDS)
		☐ Traditional piped system
Do you propose using separate highway surface water drainage systems?		☐ Yes ☐ No
If the surface water rate is attenuated, to what rate is it attenuated?		5 litres/sec
What is the proposed impermeable area per connection?		14450 m^2
What are the proposed connection points? (For example, 'X' properties to TW manhole ref 'Y')	4202	3253 N.B. NO HIGHWAY DRAINAGE

Please note: The developer is expected to follow the local authority's drainage strategy and be able to demonstrate how the proposed (attenuated) discharge rate of any surface water flows have been calculated. For developments in Greater London, please refer to the London Plan Drainage Hierarchy (Policy 5.13). We will challenge the rates provided if they are not in line with those based on the local drainage strategies.

Section E - What next?

(i) What we need to process your application:

- [x] **Completed application** (ensure all relevant sections of this form are completed in full)
- [x] **Site location plan** (showing the site with nearby buildings, road and any sewers)
- [x] **Scaled site layout** (showing existing and proposed layouts including Point of Connection to our water network)
- [ ] **Site drainage strategy plan** (if available at this stage showing all proposed sewers, pipe sizes and gradients)
- [ ] **CCTV and topographical surveys** (if available for existing brownfield sites)

Please make sure any attachments are in PDF format and don't exceed a total of 20MB in size per email. All drawings must be of suitable detail and have a drawing reference number on them.

Please note: without this information we may need to make assumptions about your requirements when calculating your budget estimate (if requested).

(ii) How we'll use this information

We'll use the information you give on this application form, and potentially share it with our delivery partners, to provide the service you've requested.

This could include contacting you to discuss your application and/or provide more details, visiting the site where work needs to be carried out and invoicing you when appropriate. Your feedback is important to us, so we may also use the information to ask for your feedback on how we can improve our performance.

We won't use this information for marketing purposes without contacting you to seek your consent.

You can find Thames Water's privacy policy at **thameswater.co.uk/Legal/Privacy**.

(iii) Declaration

Print name	CURTIS BLAIR
Job title	SENIOR ENGINEER
Company	WATERMAN GROUP
Date	29.10.19
Signature	

(iv) Submitting your application

Please send your completed form to receive your capacity check in 21 calendar days:

Via email:

developer.services@thames water.co.uk

Or send to:

Thames Water Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB

Getting in touch

For enquiries regarding this application or any other questions relating to your building or development work please contact us:

thameswater.co.uk/developerservices

developer.services@thameswater.co.uk

0800 009 3921
Monday – Friday, 8am – 5pm

Thames Water,
Developer Services,
Clearwater Court,
Vastern Road,
Reading,
Berkshire RG1 8DB

04/19

Curtis Blair

Waterman Group
Pickfords Wharf
Clink Street
London
SE1 9DG

Wastewater pre-planning
Our ref **DS6067234**

12 November 2019

Pre-planning enquiry: Capacity Confirmation

Site: 18 Syon Lane, Brentford, Isleworth TW7 5QE

Dear Curtis,

Thank you for providing information on your development.

Proposed site: Flats (497 units), Commercial premises (10800m2)
Proposed foul water discharge by gravity into manhole TQ16774202.
Proposed surface water discharge at 5.0 l/s for all storm events up to and including 1:100yr+40%CC into manhole TQ16773253.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewer capacity within the existing Thames Water sewer network.

Foul Water

From the information you have provided, we can confirm that the existing foul sewer network does have sufficient capacity to accommodate the proposed foul water discharge from the proposed development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient sewerage capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that that the hierarchy of disposal methods have been examined would we accept a restricted discharge of **5.0 l/s** into the public surface water sewer.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 020 3577 9224.

Yours sincerely

Hemlata Gurung
Technical Coordinator
Developer Services – Sewer Adoptions Team

Appendix B Syon London Borough of Hounslow Drainage Assessment Form

September 2020

SYON GARDENS

HOMEBASE BRENTFORD SITE, TW7 5QE

Surface Water Drainage Assessment

Consultant: Waterman Group

St Edward
Designed for life

Drainage Assessment Form

We require applicants to complete this Drainage Assessment Form (DAF) and submit it to the Local Planning Authority, referencing from where the information in the submission document is taken. The form is supported by the Defra/EA guidance on Rainfall Runoff Management document (www.evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/Rainfall_Runoff_Management_for_Developments_-_Revision_E.sflb.ashx) and aligns to the tools on www.UKsuds.com.

1. Site details

SITE DETAILS		NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Site Name	Homebase Site, Syon Lane	
LPA reference (if applicable)		
Address & postcode	Syon Lane, Brentford, Isleworth, TW7 5QE	
Grid reference	516420,177340	Centre point of the site in eastings, northings (XXXXXX, YYYYYY) format.
Brief description of proposed work	Replacement of the existing 4,180 m^2 of commercial space with a mixed used development of 480 homes and 10,550 m^2 of commercial space. Additional car and cycle parking is also being provided.	For example, type of development, number of units etc.
Is the existing site Brownfield or Greenfield?	Brown Field	Brownfield = developed. Greenfield = undeveloped.
Total site area (Ha)	1.445 ha	The area, in hectares, of the whole development site including any large parkland areas and public open space.
Significant public open space (Ha)	0 ha	The area, in hectares, of any large parkland areas or public open space situated within the site which remains largely unchanged and is not provided with positive drainage
Area positively drained (Ha)*	1.445 ha	This is the total development area that is served by the drainage system. It is the difference between the total site area and the significant public open space.

Is the site currently known to be at risk of flooding from any sources? If so, please state and provide evidence.	Low Risk of Surface Water Flooding Low Risk of Fluvial Flooding	Please attach surface water and fluvial flood risk maps (as shown on the Environment Agency's website) and any records of known historic flooding at the site.

***** The Greenfield runoff rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA SuDS Manual for details.

2. Impermeable area

	EXISTING	PROPOSED	DIFFERENCE (PROPOSED-EXISTING)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Impermeable area (Ha) Surfaces which do not permit infiltration of water into the ground.	1.445 ha	1.445 ha	0 ha	If proposed > existing, then runoff rates and volumes will be increasing.
Drainage Method Rainwater harvesting/infiltration/SuDS/ watercourse/sewer	TBC	Surface Water Sewer		See the London Plan Policy 5.13 Drainage Hierarchy. If the existing drainage was via infiltration and the proposed is not, section 3 should provide evidence as to why.

3. Is infiltration on-site suitable? Storage is required for the additional volume from site but also for holding back water to slow down the rate of discharge from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume is not permitted to flow rapidly overland, into watercourses or into the sewer system and hence potentially increase flood risk on site and/or downstream of the site. You can either infiltrate the stored water back into the ground or if this is not possible, hold it back with on-site storage, allowing gradual discharge at a controlled rate. Please fill in the table to show the extent of your investigations as to whether infiltration is a possible route for runoff to be discharged to.

			NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Infiltration	**State the site's geology (including superficial deposits where known)**	Underlying London Clay	Infiltration rates are highly variable and infiltrating into made (i.e. unnatural) ground should be avoided.
	State the site's known Source Protection Zones (SPZ)	No SPZ Within Site	Please refer to the Environment Agency website to identify any source protection zones (SPZ).
	What is the development site's infiltration rate?	Deemed unfeasible due to high water table	Infiltration rates should be worked out in accordance with BRE 365. If infiltration is the preferred method of drainage, then rates should be no lower than $1x10^{-6}$ m/s.
	Were infiltration rates obtained via a desktop study or from infiltration tests?	High water table and geology results obtained from boreholes	If it is not feasible to access the site to carry out infiltration tests before the application is submitted, a desktop study could be undertaken looking at the underlying geology of the area and assuming a worst-case infiltration rate. If a desktop study demonstrated that infiltration could be feasible then a ground

			investigation will need to be completed to evidence that infiltration can be used as part of the scheme without increasing risk.
	At what depth below ground is the water table (groundwater level)?	0.9 m - 2.7 m	Where known, please use borehole test results and state the time of year these were carried out. If high groundwater levels are considered to be an issue, then borehole testing should be completed as part of a ground investigation.
	State the distance between the proposed infiltration device base and the water table	0 m	If the ground conditions are found to be suitable from a desktop survey or ground investigation, a minimum of 1m depth between the base of the infiltration device and the water table is required to protect groundwater quality and ensure groundwater does not enter infiltration devices. Avoid infiltration where this is not possible.
	Is the site contaminated? If yes, consider advice from others on whether infiltration is a safe solution.	TBC, potential contamination from multiple sources in the historic and current case	A ground investigation will need to consider potential contamination to groundwater. Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above information, is infiltration feasible?		**Yes / (No)**	If infiltration is not feasible the applicant should consider the options in section 4. If infiltration is feasible, then it can be combined with the methods in section 4.

4. Method proposed for discharge of surface water *(in line with the London Plan Policy 5.13).* Please select multiple options where necessary. Where an option is not deemed possible, sufficient justification must be submitted with supporting evidence where necessary.

	YES	NO	EVIDENCE THAT THIS IS OR IS NOT POSSIBLE	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Rainwater harvesting	/		Being proposed for the development.	Rainwater harvesting is where rainwater is stored on site for reuse. For example, water for gardening, domestic use etc. Harvesting features could include, but are not limited to, rainwater harvesting tanks and water butts.
Infiltration		/	The development shall take up the majority of the site boundary. Infiltration is therefore deemed unfeasible given the inability to provide a soakaway outside of the recommended 5m distance from the development.	Allowing space for rainwater to soak into the ground, as per natural methods. If proposed, these must satisfy the requirements shown in section 3 of this DAF.
Attenuation of rain water in ponds and open water features		/	The development shall take up the majority of the site boundary. Open water features is therefore deemed unfeasible given the lack of space.	Please see the CIRIA SuDS Manual (C753) for further details about above ground attenuation techniques. Examples could include, but are not limited to, swales, detention basins, rain gardens, planters, etc

Attenuation of rain water through tanks or sealed water features	/		Being proposed for the development.	Underground storage features which gradually release water. Please note that these are less sustainable than above ground methods and are usually more complex to maintain.
To watercourse		/	The River Brent is located approximately 500m North-East of the site, a lake within Syon Park is located approximately 650m South and the River Thames is located approximately 1.3km South of the site, it deemed unfeasible to discharge to these locations given existing developments and infrastructure.	Is there a watercourse nearby? If so please name, stating approximate distance from site. Evidence of discharge agreement with the Environment Agency (for 'main rivers') or the Lead Local Flood Authority (for 'ordinary watercourses', i.e. all non-'main rivers') will be required.
To surface water sewer	/		Thames Water Sewer surface water sewer located on Syon Lane has been confirmed as having capacity for the proposed 5 l/s discharge from the site.	The confirmation from sewer provider that sufficient capacity exists for this connection will be required.
To combined sewer		/	Thames Water Sewer surface water sewer located on Syon Lane has been confirmed as having capacity for the proposed 5 l/s discharge from the site.	This would only be acceptable where other options are not reasonably practical and will not be accepted where separate sewer systems currently exist on or close to the site.

5. Supporting calculations – in order to check that the proposed development is designed to conform to standards, please complete the following three tables and submit your supporting calculations.

A. Peak discharge rates – this is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

Please circle which method was used to calculate the Greenfield Runoff Estimation:	IH124 method / (FEH method) / Other (please state)

London Plan policy 5.13*: Developers should aim for a Greenfield runoff rate from their developments.*

London Plan Sustainable Design and Construction SPG section 3.4.10: *All developments on Greenfield sites must maintain Greenfield runoff rates. On previously developed sites, runoff rates should not be more than three times the calculated Greenfield rate.*

	GREENFIELD RATES (L/S)	EXISTING RATES (IF PREVIOUSLY DEVELOPED) (L/S)	PROPOSED RATES (L/S)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
QBAR	2.22 l/s	124 l/s	5 l/s	QBAR is approximately the 1 in 2 year storm event.

1 in 1 year	1.88 l/s	106 l/s	5 l/s	Proposed discharge rates (with mitigation) should be no greater than the Greenfield rates for all corresponding storm events. If restrictions to Greenfield rates cannot be achieved then sufficient justification (with supporting evidence) must be submitted. Please note that discharging all flow, regardless of the corresponding storm event intensity, from site at the existing 1 in 100 year event rate would increase flood risk during smaller events and therefore would not be permitted. Applicants must also check and adhere to existing Local planning policy where further runoff restrictions may apply.
1 in 30 year	5.10 l/s	297 l/s	5 l/s	
1 in 100 year	7.07 l/s	388 l/s	5 l/s	
1 in 100 year plus climate change (CC)			5 l/s	To mitigate for climate change, the proposed 1 in 100 year +CC runoff rate must be no greater than the Greenfield 1 in 100 year event runoff rate. The peak rainfall intensity allowance used must be in line with the latest Environment Agency's climate change allowance guidance. Currently this requires allowances of 20% and 40% to be added, and the most appropriate one used and justified. Typically for heavily urban sites we would ask for 40% to be used.

B. Discharge volumes post development

The Non-Statutory Technical Guidance for SuDS: *Where reasonably practicable, for Greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the Greenfield runoff volume for the same event. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.*

	STORAGE VOLUME REQUIRED TO ACHIEVE THE GREENFIELD RUNOFF RATE (M^3)	PROPOSED STORAGE VOLUME ON SITE POST-DEVELOPMENT (M^3)	IF THE PROPOSED STORAGE VOLUME ON SITE POST-DEVELOPMENT IS LESS THAN THE STORAGE VOLUME REQUIRED TO ACHIEVE THE GREENFIELD RUNOFF RATE, PLEASE PROVIDE A JUSTIFICATION AS TO WHY. APPLICANTS MUST ALSO CHECK AND ADHERE TO EXISTING LOCAL PLANNING POLICY WHERE FURTHER RUNOFF RESTRICTIONS MAY APPLY.
1 in 100 year, 6 hour event	1365 - 1633 m^3	1400 m^3	Total volume of attenuation has been based on the upper limit of the 1 in 100 year event + 40% climate change for the proposed 5 l/s discharge for the site. Further attenuation will be provided at detailed design stage should more accurate modelling prove this necessary.

C. Storage methods – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse or sewer to be limited to an acceptable rate to protect against erosion and flooding downstream. The volume needing storage is a function of the amount of development relative to the Greenfield discharge rate.

TYPE OF SUDS FEATURE	VOLUME (M^3)	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
1 Below ground attenuation	1400 m^3	SuDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SuDS devices allows treatment but not infiltration. See the CIRIA SuDS Manual (C753). **If no storage features have been proposed please explain why this is the case and provide evidence to support this reasoning in the box below.**
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL	1400 m^3	This value should be equal to or greater than the 'Proposed storage volume' value in section 5B.

IF NO STORAGE FEATURES HAVE BEEN PROPOSED IN THE SECTION ABOVE, PLEASE EXPLAIN WHY THIS IS THE CASE AND PROVIDE EVIDENCE TO BACK UP THIS REASONING IN THIS BOX: (EVIDENCE MUST BE SUFFICIENTLY DETAILED TO DEMONSTRATE THAT A SUDS BASED SYSTEM IS IMPRACTICAL FOR THIS SITE)

6. Please confirm…

	EVIDENCE (PLEASE NAME RELEVANT EVIDENCE DOCUMENT(S))	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
That the drainage system can contain the 1 in 30 storm event without flooding.	Attenuation has been sized to have capacity for the 1:100 year event +40% CC. The wider network shall be designed in accordance with sewers for adoption and best practice.	The Non-Statutory Technical Standards for SuDS states that no part of the site should flood during a 1 in 30 year event (unless that area is designated to hold and/or convey water as part of the design). This is also a requirement for Sewers for Adoption and is good practice.
That any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	Attenuation has been sized to have capacity for the 1:100 year event +40% CC. The wider network shall be designed in accordance with sewers for adoption and best practice.	Safely: not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 5A rates.
How runoff flows from storm events in excess of 1 in 100 years will be managed on site.	Flood locations and landscape gradients shall ensure that excess water runs away from the site to ensure the property is not at risk.	As per the Non-Statutory Technical Standards for SuDS, proposed methods for managing excess flows should be demonstrated so as to minimise the risks to people and property, e.g. through evidence of exceedance routes. These exceedance proposals should be for runoff in storm events greater than 1 in 100 year plus climate change.

How are rates being restricted (hydrobrake etc.)?	A Hydrobrake shall be used to restrict flows to 5 l/s at the final manhole.	Recent development in some flow control devices now allow flow rates to be controlled as low as 0.7l/s without pipe blockages (see Hydrobrake)

7. Adoption and maintenance – please provide the following information ***(Note: This space should only be used to reference a standalone document that covers details of both maintenance and adoption of the scheme)***

	ADOPTION AND MAINTENANCE INFORMATION	NOTES FOR APPLICANTS & LOCAL AUTHORITIES
Please confirm the proposed owners/adopters of the entire drainage systems throughout the life of the development. Please list all the owners and contact details.	St Edward Homes Limited Tom Fox Email: Tom.Fox@berkeleygroup.co.uk Phone: 020 7819 4529	If there are multiple owners, a drawing illustrating exactly which features will be within each owner's remit must be submitted with this DAF.
How is the entire drainage system to be maintained?	Inspection of silt traps and manholes for sediments or debris - Quarterly or as required. Jetting of main system to remove sediment and avoid blockages - Annually or as required. Inspection and maintenance of attenuation features - As advised by manufacturer	Clear details of the maintenance proposals of all elements of the proposed drainage system over the lifetime of the development must be provided. Poorly maintained drainage can lead to increased flooding problems in the future. Please note that a maintenance plan should be provided as a standalone document, so that it can then be implemented easily by whoever adopts the drainage scheme going forward.

8. Evidence. Please identify where the details quoted in the sections above have been taken from i.e. supporting plans, calculations, reports etc. Please also provide relevant drawings that need to accompany your submitted DAF, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc.).

Form Section	Document reference where details stated above are taken from	Page Number(s)
Section 2		
Section 3		
Section 4		
Section 5A	Greenfield and Existing Runoff Rate Calculations	11
Section 5B	Attenuation Volume Requirement Calculations	12
Section 5C		
Section 6		
Section 7		

This DAF should be completed using evidence from the documents submitted with this application. This should include site plans and, if necessary for the site, a Flood Risk Assessment (FRA) (see the Local Planning Authority's Strategic Flood Risk Assessment for details of when a FRA is required). The DAF serves as a summary sheet of the drainage proposals and should clearly show that the proposed runoff rate and volume as a result of development will not be increased. If, without the use of SuDS, there would be an increase in runoff rate and/or volume, the rate and volume sections should be completed to set out how the additional rate/volume will be managed.

Form completed by: James King

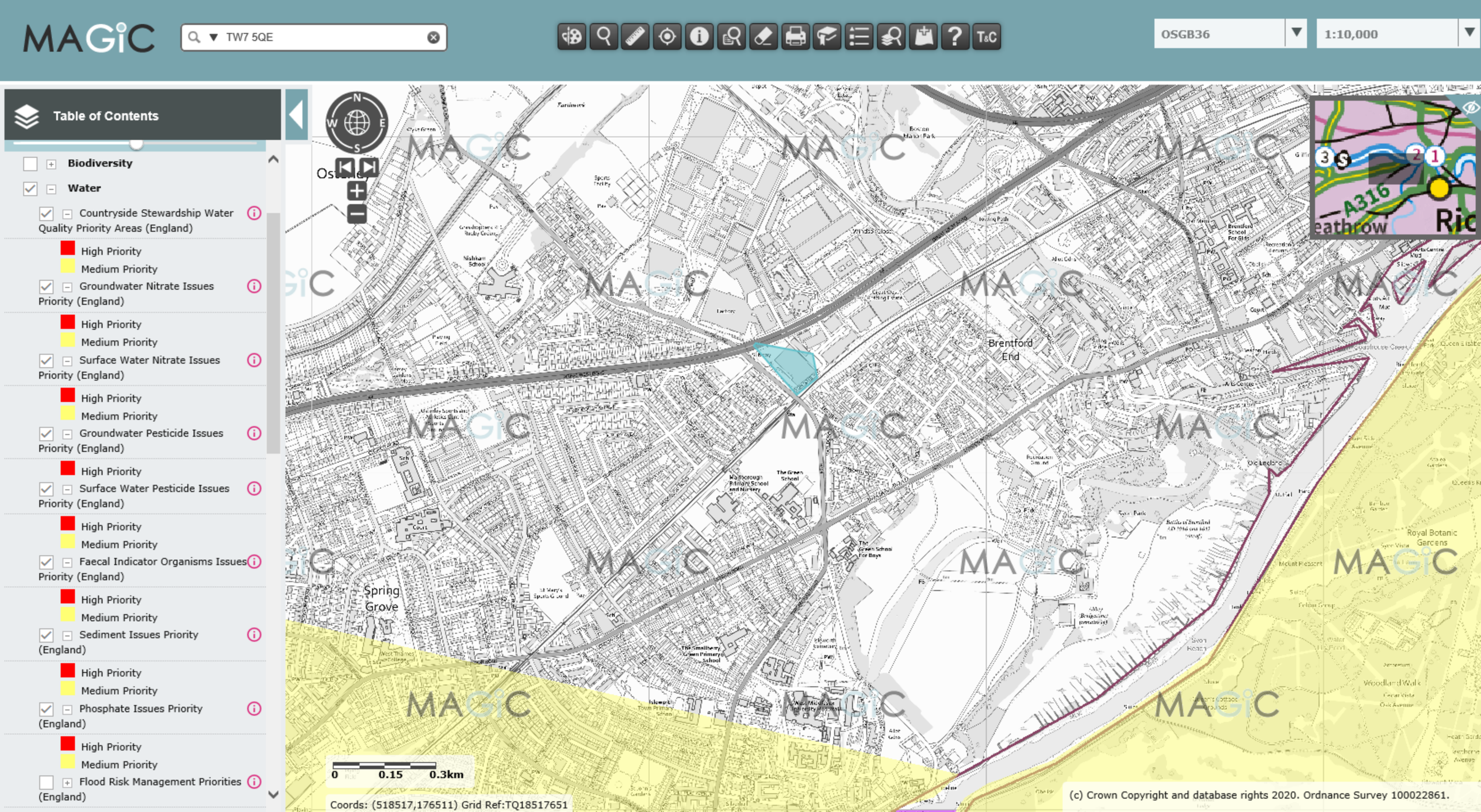
Qualification of person responsible for signing off this Drainage Assessment Form: Andrew Harrison - Director

Company: Waterman Group

On behalf of (Client's details): Berkeley Homes

Date: 09/09/2020

Evidence


MAGiC
TW7 5QE
OSGB36
1:10,000
Table of Contents
Biodiversity
Water
Countryside Stewardship Water Quality Priority Areas (England)
High Priority
Medium Priority
Groundwater Nitrate Issues Priority (England)
Surface Water Nitrate Issues Priority (England)
Groundwater Pesticide Issues Priority (England)
Surface Water Pesticide Issues Priority (England)
Faecal Indicator Organisms Issues Priority (England)
Sediment Issues Priority (England)
Phosphate Issues Priority (England)
Flood Risk Management Priorities (England)
Brentford End
Spring Grove
A316
0 0.15 0.3km
Coords: (518517,176511) Grid Ref:TQ18517651
(c) Crown Copyright and database rights 2020. Ordnance Survey 100022861.

Section 5A

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: James King
Site name: Syon Lane
Site location: Syon Lane

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 51.48290° N
Longitude: 0.32485° W

Reference: 3571308756
Date: Mar 18 2020 09:54

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.445

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR
SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	604	604
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.22	2.22
1 in 1 year (l/s):	1.88	1.88
1 in 30 years (l/s):	5.1	5.1
1 in 100 year (l/s):	7.07	7.07
1 in 200 years (l/s):	8.29	8.29

Rational Method For Existing Discharge Rates

Q= CiA

C = Runoff Coefficient 0.85 (Roofs and Ashphalt)

(mm/hr) From MicroDrainage

I = Rainfall Intensity

36.442	(mm/hr)	=	0.010122778 (l/s/m^2)	Q-Bar (2 Year)
31.093	(mm/hr)	=	0.008636944 (l/s/m^2)	1 Year
87.136	(mm/hr)	=	0.024204444 (l/s/m^2)	30 Year
113.896	(mm/hr)	=	0.031637778 (l/s/m^2)	100 Year

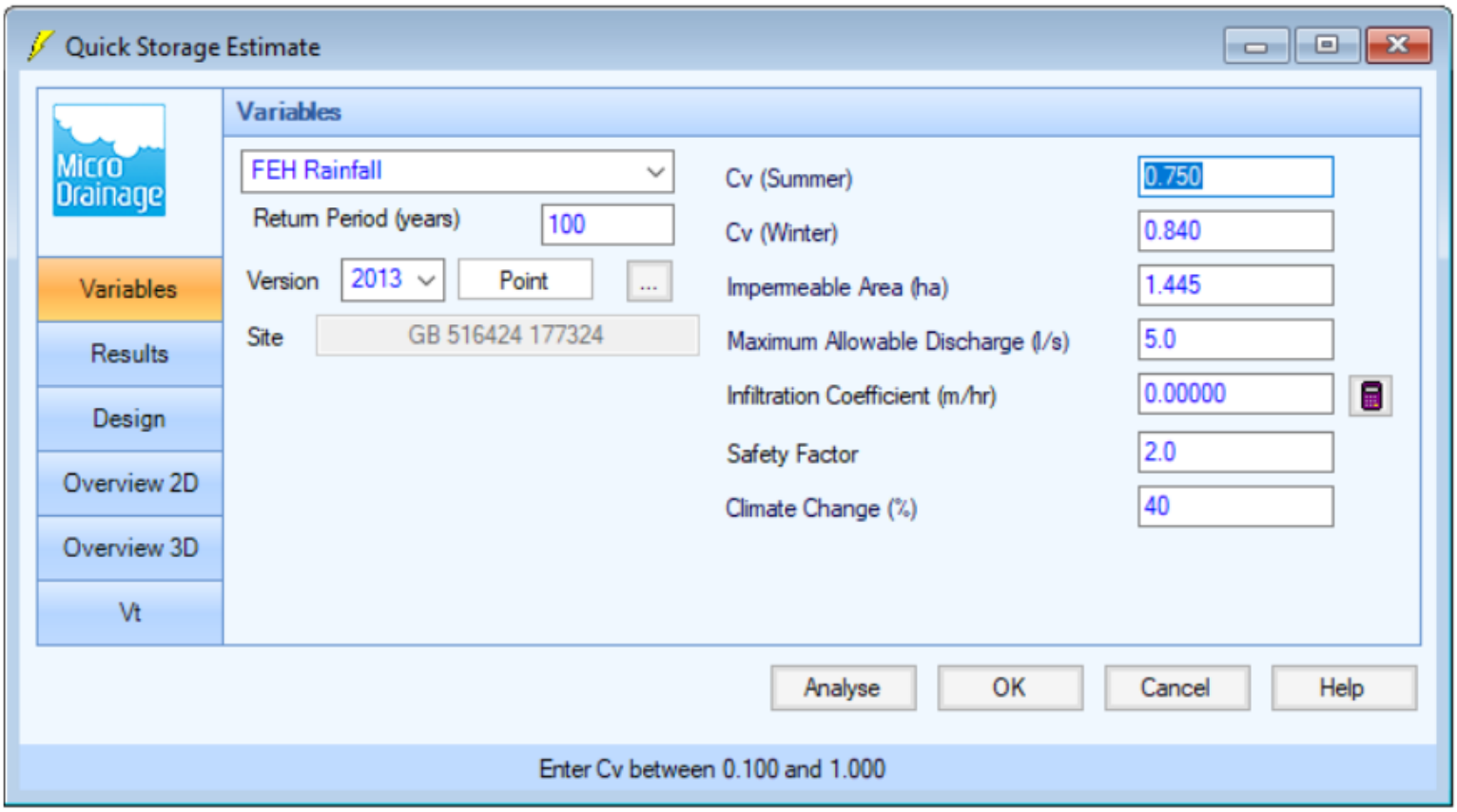
A = area (m) 14450 (m^2)

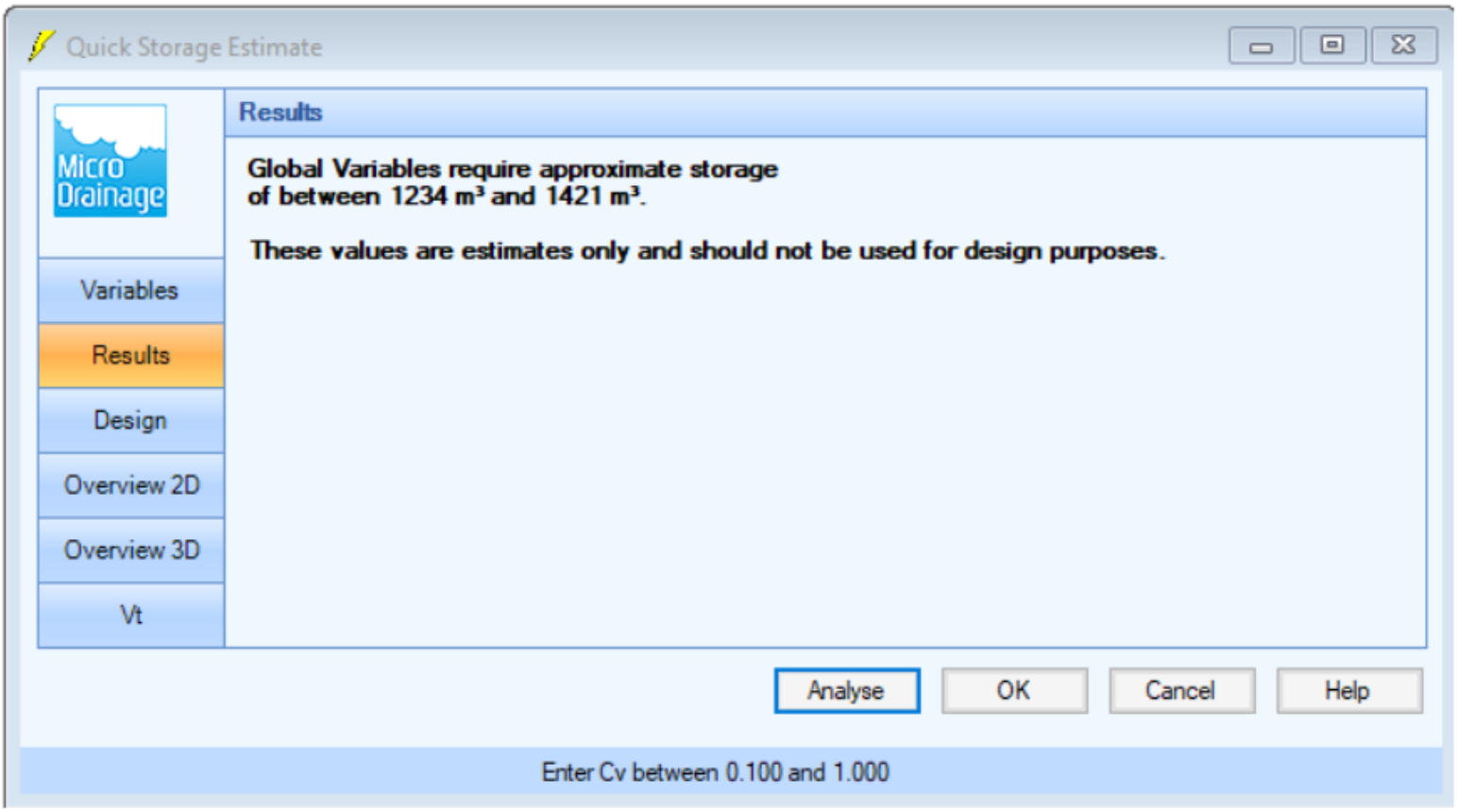
Q Values (l/s)

Q-Bar	124.333 l/s
1 Year	106.083 l/s
30 Year	297.291 l/s
100 Year	388.591 l/s

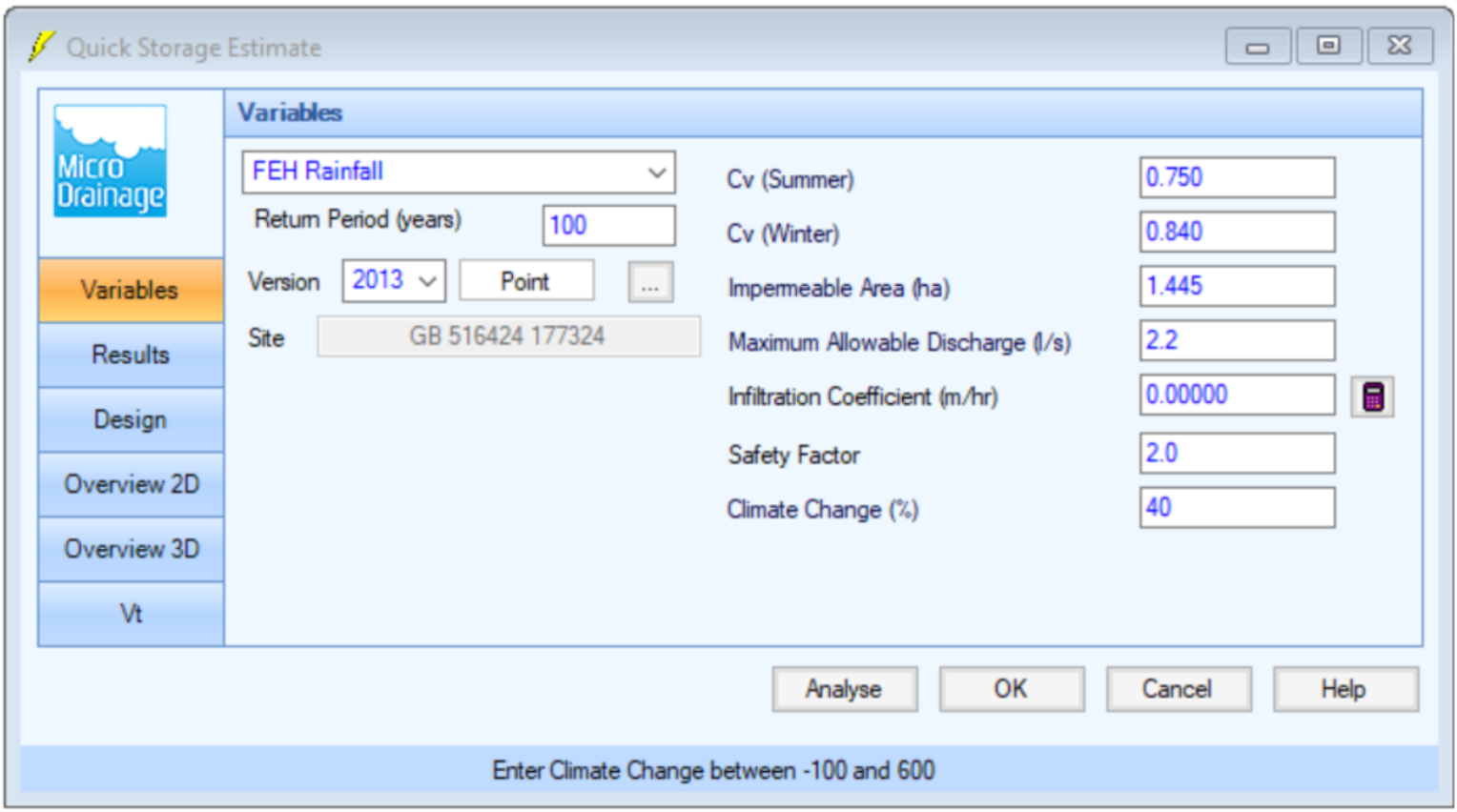
Section 5B

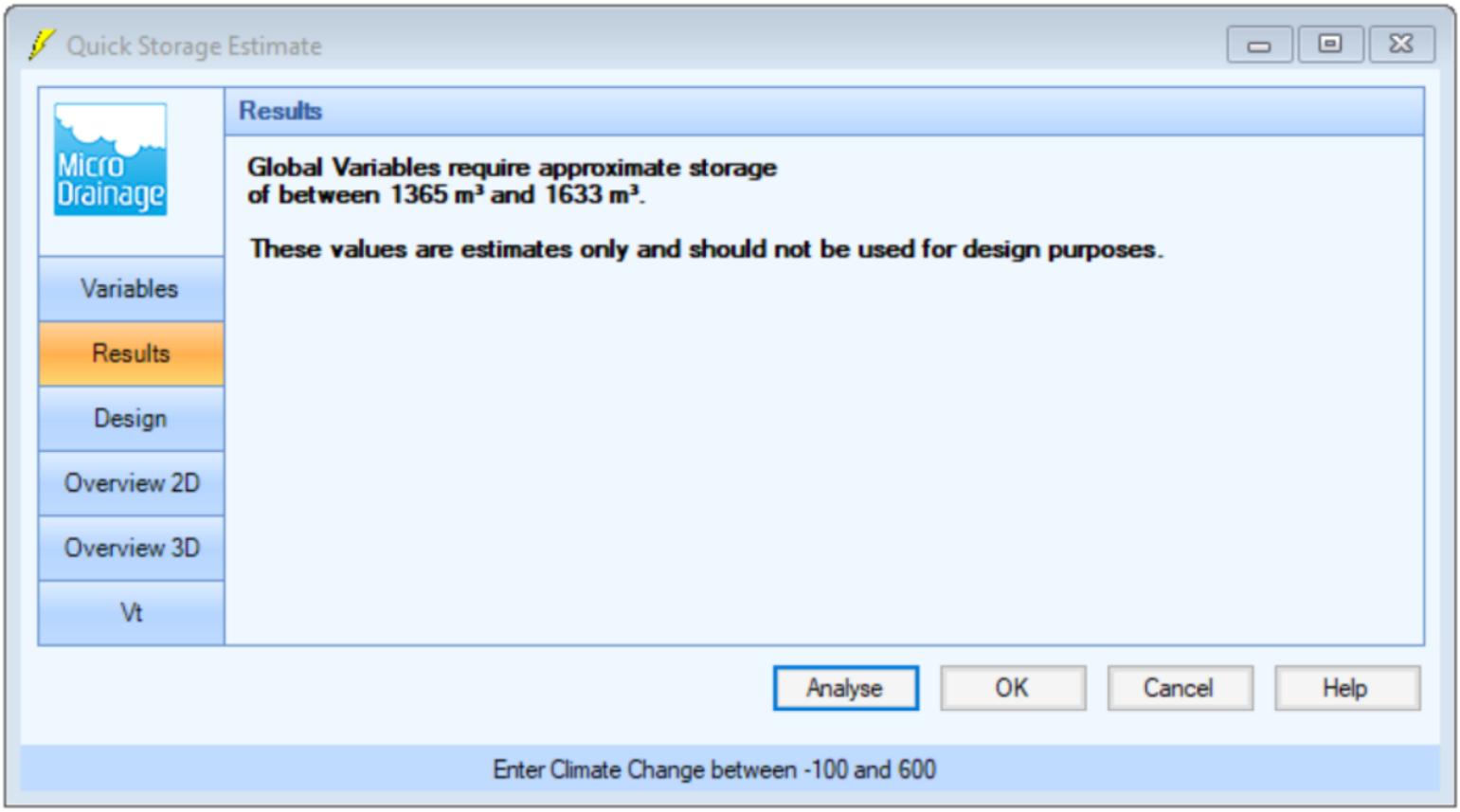
5.0 l/s Discharge Rate Quick Storage Calculation





2.2 l/s Discharge Rate Quick Storage Calculation





Environment Agency Flood Maps

Select the type of flood risk information you're interested in. The map will then update.

Extent of flooding

Enter a place or postcode

Extent of flooding from rivers or the sea

Select the type of flood risk information you're interested in. The map will then update.

Extent of flooding

Enter a place or postcode

Extent of flooding from surface water

Drainage Layouts

SYON LANE BELOW GROUND DRAINAGE STRATEGY REV 4

JAMES KING

WATERMAN GROUP

09.09.2020

PROPOSED BELOW GROUND SURFACE WATER DRAINAGE

PROPOSED BELOW GROUND FOUL WATER DRAINAGE

EXISTING PUBLIC SURFACE WATER SEWER

EXISTING PUBLIC FOUL WATER SEWER

PROPOSED BELOW GROUND ATTENUATION TANK

REVISED EXTENT OF THE BASEMENT

ASSUMED RWPs DROPPING ABOVE THE BASEMENT WILL OFFSET AT HIGH LEVEL AND PENATRATE BASEMENT WALL.

RAINWATER CATCHEMENT BEING COLLECTED IN SYON GATE WAY TO POTENTALLY BE COLLECTED BY EXISTING ROAD DRAINAGE. TBC UPON FURTHER INVESTIGATIVE WORKS.

1400m^3 OF ATTENUATION TO BE PROVIDED VIA TUBOSIDER LARGE DIAMETER PIPEWORK. DIAMETERS TO BE DETERMINED UPON THE DEVELOPMENT OF THE FOUNDATION DESIGN. ASSUMED IL = 16.50

MANHOLE TO BE INSTALLED WITH HYDROBRAKE TO RESTRICT FLOWS TO 5 l/s

ASSUMED THAT FOUL DRAINAGE FROM THE RESIDENTIAL AREAS WILL OFFSET AT HIGH LEVEL AND PENTATRATE BASEMENT WALL IN THE SOUTH OF THE SITE.

FINAL MANHOLE WILL NEED TO BE CONSTRUCTED AT AN EXCESSIVE DEPTH TO FACILLITATE MAXIMUM 1.5m BACKDROP INTO THAMES WATER MANHOLE INLINE WITH ADOPTABLE STANDARDS.

TW3302
CL= 19.74
IL= 18.31

TW3354
CL= 19.61
IL= 18.32

TW3353
CL= 20.27
IL= 17.95

TW2305
CL= 20.73
IL= 18.24

TW3352
CL= 20.65
IL= 17.99

TW3351
CL= 20.44
IL= 18.04

TW2358
CL= UNKNOWN
IL= UNKNOWN

TW3301
CL= 20.57
IL= 14.52

TW3350
CL= 20.59
IL= 15.12

TW3253
CL= 17.95
IL= 14.05

TW3204
CL= 17.95
IL= 14.02

TW4202
CL= 17.32
IL= 10.88

TW4252
CL= 17.31
IL= 11.03

GENRERAL NOTES

SUBJECT TO FURTHER INVESTIGATIVE WORKS AND 3rd PARTY APPROVAL.

BASED ON 5l/s SURFACE WATER DISCHARGE AND 40% ALLOWANCE FOR CLIMATE CHANGE.

SYON LANE BASEMENT BELOW GROUND DRAINAGE STRATEGY REV 3

JAMES KING

WATERMAN GROUP

09.09.2020

PROPOSED BELOW GROUND FOUL WATER DRAINAGE

OUTFALL TO CONNECT TO FOUL WATER DRAINGE FOR WIDER SITE. POTENTIAL REQUIREMENT FOR BASEMENT DRAINAGE TO BE PUMPED TO HIGH LEVEL, TBC ONCE PIPE LEVELS AND SEWER FLOODING RECORDS ARE KNOWN.

SYON GATE WAY

Attenuation pipework grid (refer to SE drawings)