THE BOATHOUSE, TWICKENHAM

Flood Risk Assessment and Surface Water Drainage Strategy

Prepared for: The Boathouse Twickenham Ltd

SLR Ref: 425.064470.00001
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1.0 Introduction

1.1 Background

SLR Consulting Limited (SLR) has been appointed by The Boathouse Twickenham Ltd ("the client") to provide a Flood Risk Assessment and Surface Water Drainage Strategy to support a full planning application for the demolition of the existing building and the construction of a residential scheme comprising 3 properties with associated hardstanding and soft landscaping at The Boathouse, Ranelagh Drive, Twickenham, TW1 1QZ ("the site").

A plan of the development proposals is included in Appendix 01.

This Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) has been prepared under the direction of a Technical Director in Hydrology at SLR who specialises in flood risk and associated planning matters. Reporting has been completed in accordance with guidance presented within the National Planning Policy Framework[1] (NPPF) and its associated Planning Practice Guidance[2] (PPG), taking due account of current best practice documents relating to the assessment of flood risk published by the British Standards Institution BS8533[3] and local planning policies.

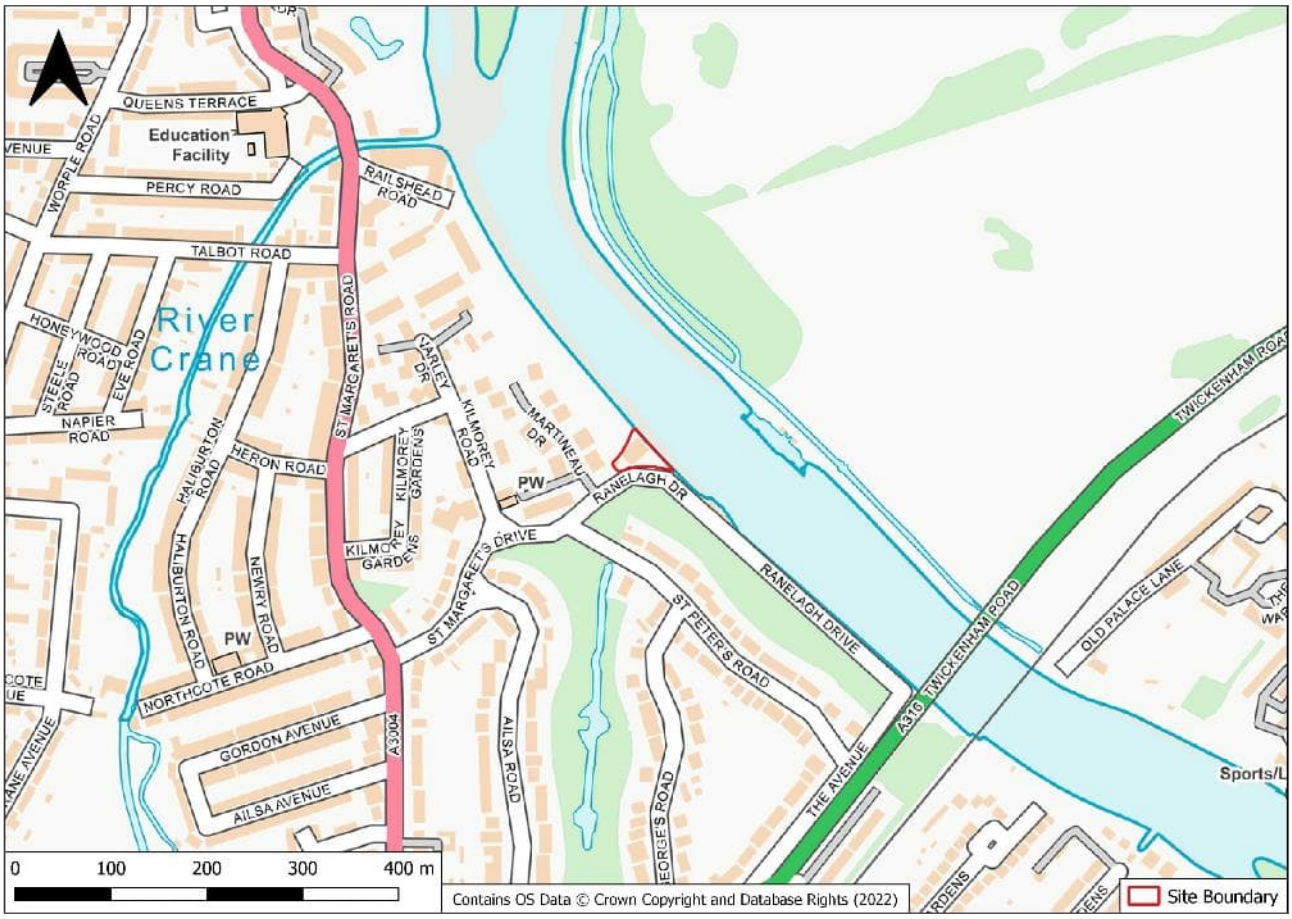
1.2 Site Location

The site is located along the River Thames between Isleworth and St Margarets in West London, centred on National Grid Reference (NGR) TQ 16875 75063. The site is accessed from Ranelagh Drive and St Margarets Drive to the south which lead onto the Thames Pathway along the river frontage. This forms the eastern boundary of the site. St Margarets Drive provides a direct access route to the A3004, connected to the A316.

A site location plan is provided below in Figure 1-1.

1 Revised National Planning Policy Framework: Communities and Local Government (July 2021)
2 Planning Practice Guidance, Flood Risk and Coastal Change: Communities and Local Government (August 2022)
3 BS8533:2017, Assessing and managing flood risk in development: Code of Practice (2nd Edition, December 2017)

Figure 1-1
Site Location Plan



1.3 Administrative Context

The site is under the planning jurisdiction of the London Borough of Richmond upon Thames (LBRuT), who are responsible for the determination of this application. They are also the Lead Local Flood Authority (LLFA) for the area, dealing with matters relating to localised flood risk and drainage.

1.4 Planning History

We would note that in response to a previous version of this scheme, a number of objections were received from the Environment Agency (EA Ref: SL/2022/122337/01-L01). A response to those objections was set out within a formal letter dated 1 February 2023, SLR Reference: 425.064470.00001 (Appendix 02).

To avoid confusion, the supporting drawings have been omitted from the letter in Appendix 02 as similar or identical drawings are now contained within this updated FRA.

We can confirm that the current proposals for this site, and this assessment, reflect that previous round of consultation.

2.0 Baseline Site Appraisal

The site currently comprises an existing building which was formerly used as a recording studio but is now in residential use (C3). The surrounding developed area is typically for residential use with small areas of urban greenspace.

The site is situated along the River Thames frontage however a small access path is provided along the eastern boundary (Thames Pathway) which separates the site from the immediate riverbank. St Margarets railway station is present c.780m south of the site with Isleworth railway station around 1.8km north west. Richmond Lock is present c.50m south east of the site.

Satellite Imagery of the site is provided below in Figure 2-1.

Figure 2-1
Satellite Imagery

2.1 Topography

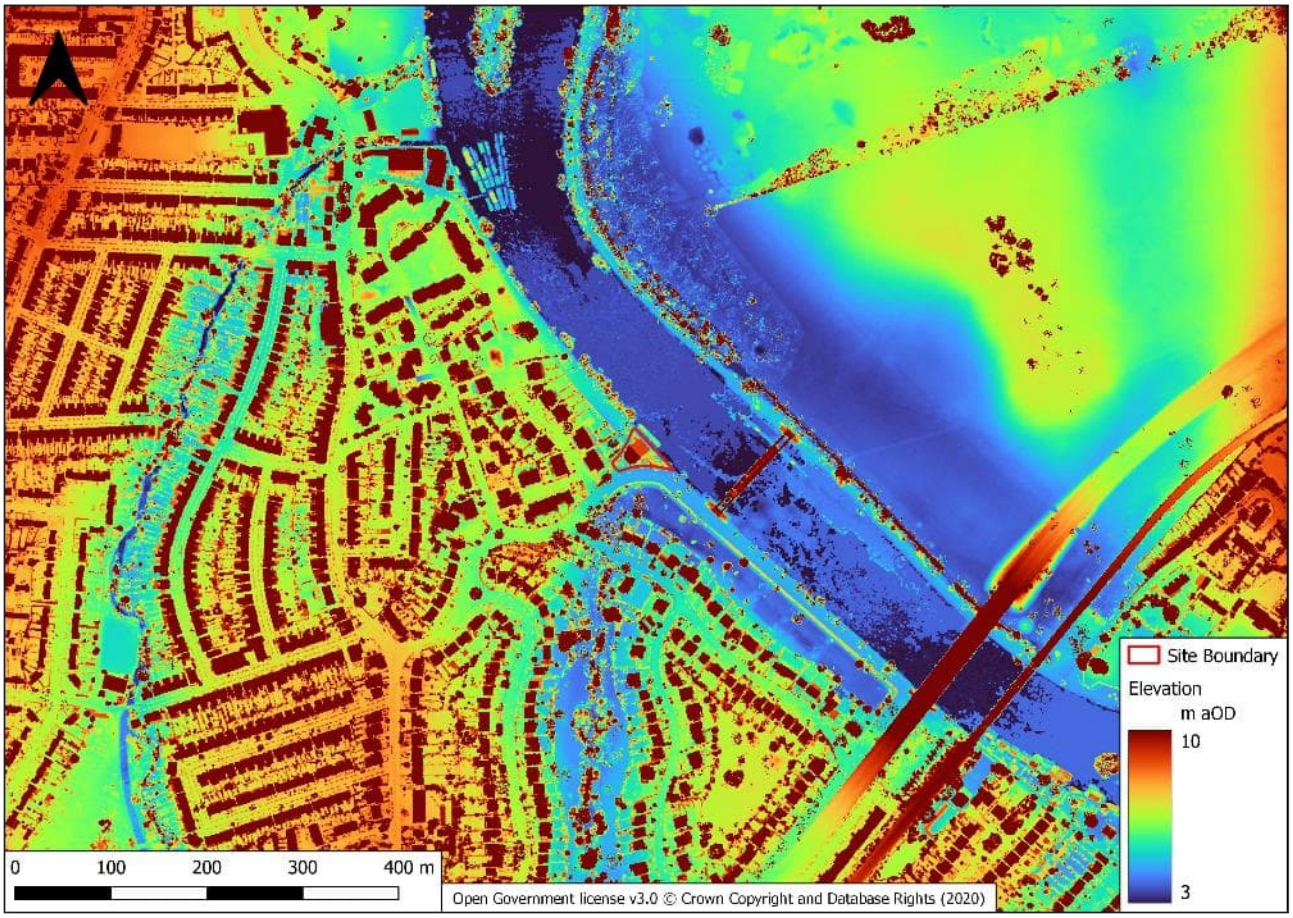
Topographic data from on and around the site, gathered using Light Detection and Ranging (LiDAR) aerial photogrammetric techniques, has been downloaded from the Environment Agency open data website[4]. The elevation data presented is a Digital Surface Model (DSM) which maps the first reflective surface and therefore

4 Environment Agency open data website http://environment.data.gov.uk

includes features such as built development and vegetation. LiDAR plots of the wider area and the site are presented in Figure 2-2 and Figure 2-3.

A topographic survey of the site is also included as Appendix 03 which corrolates well with the LiDAR data presented below. A ground model of the existing site has also been developed which is provided as Appendix 06.

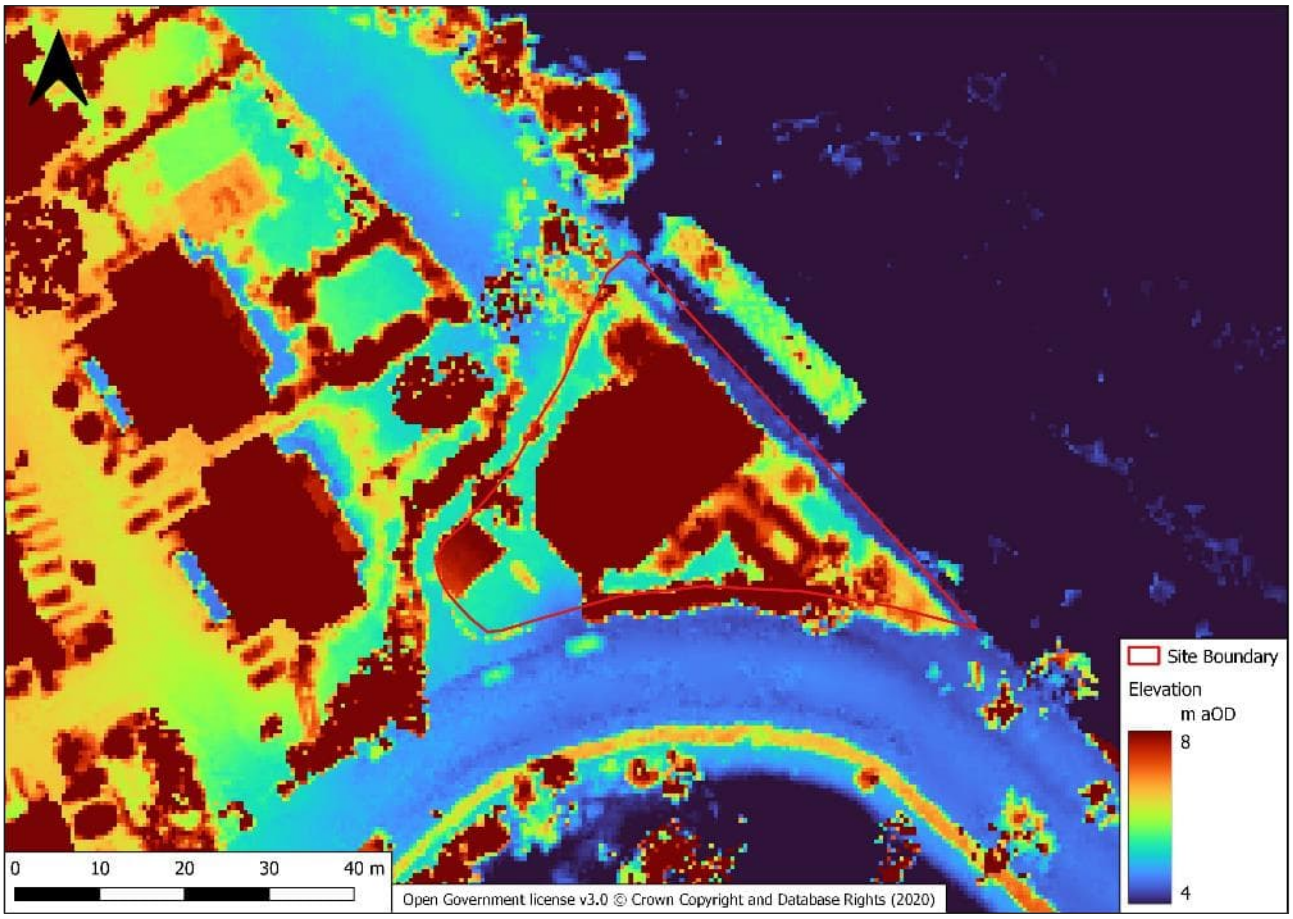
Figure 2-2
Regional Topography



Regional topography provided in Figure 2-2 is heavily dominated by the presence of the River Thames and its associated tributaries. The topography across the wider area therefore falls in variable directions but overall towards the River Thames. The banks of the River Thames have been raised out of the floodplain with protected land immediately behind the defences typically much lower.

Lower lying land is present to the south of the site which corresponds to a small unnamed water feature and woodland areas bounding Ranelagh Drive. These areas are elevated to around 3.5m above Ordnance Datum (aOD) and 3.7m aOD respectively. Ranelagh Drive is typically elevated below the site around c.4.4m aOD.

Figure 2-3
Site Topography



Ground levels on the site are generally flat but do fall slightly from 5.37m above Ordnance Datum (aOD) in the south west to 5.13m aOD to the north at the pedestrian access along the boundary with the River Thames. The ground also slopes down the ramped vehicle point onto Ranelagh Drive at around 4.46m aOD.

The Thames footpath is elevated at between 4.13-4.73m aOD however the finished floor levels to the front (east) of the existing building are raised significantly above this, at around 5.85m aOD. Finished floor levels at the entrance to the existing property are slightly lower (200mm) to the south west at around 5.65m aOD. Internally the floor level for the habitable parts of the existing property drop down as low as 4.6m aOD.

2.2 Hydrology

The site is located along the frontage of the River Thames which, at this location, is a tidally influenced watercourse designated by the Environment Agency as a Main River[5]. Water levels within the Thames therefore vary daily but are typically within the region of -0.96m – 3.79m aOD[6]. Past the site, the Thames flows in a north westerly direction but beyond heads east towards its estuary some 66km away. The interface between the fluvial and tidal Thames occurs at Teddington Lock only 3.6km south of the site.

The River Crane discharges into the River Thames at a confluence 370m north west of the site, draining a total upstream catchment area[7] of around 106km^2. This watercourse flows largely over mixed permeability geology

5 Main River Map, Environment Agency
6 Tide Times – Richmond Lock, https://www.tidetimes.org.uk/richmond-lock-tide-times
7 Flood Estimation Handbook Web Service, UK Centre for Ecology & Hydrology

and drains a predominantly urban catchment area (65%)[8]. Set back from the confluence with the Thames, the River Crane flows through a set of tidal gates and water levels drop across a weir into the Thames. Water levels upstream of the weir (where the channel is considered fluvial) are at around 4.7m aOD.

There is an additional unnamed water body (referred to as Boat Lake in this report) present 95m south of the site. From mapping this feature does not appear to have an obvious inlet and is therefore likely a groundwater fed system which also receives overland flows from a small urban catchment area. Based on mapping in the Strategic Flood Risk Assessment[9], the lake is fitted with a sluice gate which, during wet periods, likely discharges elevated water within the system into the Thames but similarly prevents water ingress during periods of high tide.

2.3 Geology

The National Soil Resources Institute[10] suggests that the soils at the site consist of "*Loamy and clayey floodplain soils with naturally high groundwater*". Due the existing built development and largely impermeable concrete hardstanding, it is unlikely that these natural soils are no longer present across much of the site and instead the shallow layers comprise of made ground.

British Geological Survey (BGS) mapping[11] indicates that the site is underlain by London Clay Bedrock which comprises of clay and silt. The clay is overlain by alluvium deposits across the full extent of the site which comprise clay, silt, sand and peat.

BGS Borehole TQ17SE107, located 90m south east of the site identified 1m of Made Ground underlain by 2.8m of alluvium. Gravel and brown silty sands were identified for an additional 1.6m before striking the London Clay.

2.4 Hydrogeology

The Clay bedrock is designated by the Environment Agency as an 'Unproductive'[12] aquifer, which are defined as layers of rock or drift deposits which have low permeability and negligible significance for water supply and baseflow.

The alluvium deposits are designated as a 'Secondary B (undifferentiated)[12]' aquifer which are predominantly low permeability layers but may store limited amounts of groundwater dependant on local lithological characteristics.

The site is not located within a Source Protection Zone (SPZ) typically associated with potable groundwater abstractions.

Given the geological conditions (i.e., made ground and alluvium of varying permeability underlain by impermeable clay), we would expect groundwater to be perched within the shallow layers above the clay strata at varying depths depending on local lithology.

Boat Lake, as discussed in Section 2.2, is assumed as largely a groundwater fed system that also receives overland flows from its small surface catchment area. Water levels in Boat Lake are typically around 3.7m aOD which we assume is an approximate standing winter groundwater level locally. It is understood that due to the nature of the geology depth to groundwater will vary.

8 39094 – Crane at Marsh Farm, National River Flow Archive, https://nrfa.ceh.ac.uk/data/station/info/39094
9 Strategic Flood Risk Assessment- Level 1, London Borough of Richmond upon Thames, Metis Consultants Ltd, March 2021, https://www.richmond.gov.uk/services/planning/planning_policy/local_plan/local_plan_evidence/flooding_ground_water/flood_risk_assessment
10 Soilscapes map, http://www.landis.org.uk/soilscapes/
11 British Geological Survey, Geoindex, http://mapapps.bgs.ac.uk/geologyofbritain/home.html?
12 Magic Map Application, managed by Natural England, delivered by Landmark, https://magic.defra.gov.uk/MagicMap.aspx

2.5 Existing Site Drainage

Based on information provided on the topographic survey (Appendix 03) and wastewater asset plans provided by Thames Water (Appendix 04), surface water runoff from the existing site is intercepted by a number of drainage gullies and manholes located around the north and west of the building. These manholes appear to convey flows towards Ranelagh Drive and discharge into a Thames Water Surface Water sewer beneath the road. This sewer conveys all flows in a north eastward direction to outfall into the Thames.

During periods of high tide it is likely that the surface water sewer outfall becomes surcharged. This therefore means that during coincidental events of high tide and heavy rainfall, surface water is unable to discharge from the sewer. In such an event, surface water will surcharge from the drainage manholes/gullies on site and flow overland in line with local topography either to the east, discharging onto Ranelagh Drive, or northwards via the existing pedestrian access point onto the Thames footpath. Due to ground levels flows via either route will discharge into the Thames and away from the site.

3.0 Policy Status for Proposed Development

3.1 Development Proposals

This report supports an application for the demolition of the existing residential building and construction of 3, 4-storey residential houses with associated hardstanding and soft landscaping. These proposed properties have been developed following a pre-application submission (20/P0166/PREAPP) to the local authority. As part of this process the Environment Agency have been consulted and their advice has been incorporated into the scheme design to reduce flood risk over the lifetime of development.

The development is set to comprise four levels, these are a lower ground, ground, first and second floors. The lower ground floor will be a combination of sub surface and surface development, with a finished floor level of 3.10m aOD. The lower ground floor will only be used as a utility room / plant storage. There will be no external entrances into the lower ground floor and this level of the properties will only be accessed via the upper levels of each building.

The ground floor levels will be raised above the level of the existing property (current minimum habitable area at 4.6m aOD) and above external areas, with an entrance level of 6.9m aOD which falls to an internal level of 6.01m aOD.

The existing access points along the eastern site (Thames frontage), which currently comprise of a pedestrian walkway and doors into the building, will be removed and replaced with a new retaining wall elevated to 6.9m aOD.

External ground levels to the south of the property will be levelled to create a finished platform level of 5.10m aOD. Parking will also be provided externally to the building to the south of the property at this equivalent level.

Improvement to the public realm is also proposed through increasing the width of the riverwalk (public footpath) and providing a new seating area for the public. With regards to the building, amenity will be improved through the scheme design by which the building will face out onto the River Thames, alongside a new parking and landscaping scheme.

The proposed development masterplan is provided as Appendix 01. A ground model of the existing site has also been developed and is provided as Appendix 06.

As outlined in the PPG[2], residential institutions are classified as '*More Vulnerable*' with respect to flood risk.

For the purpose of this assessment a 100-year lifetime of development has been assumed for this residential scheme.

3.2 Flood Zone Classification

The definition of Environment Agency flood zones is provided in PPG *Table 1: Flood Zones*:

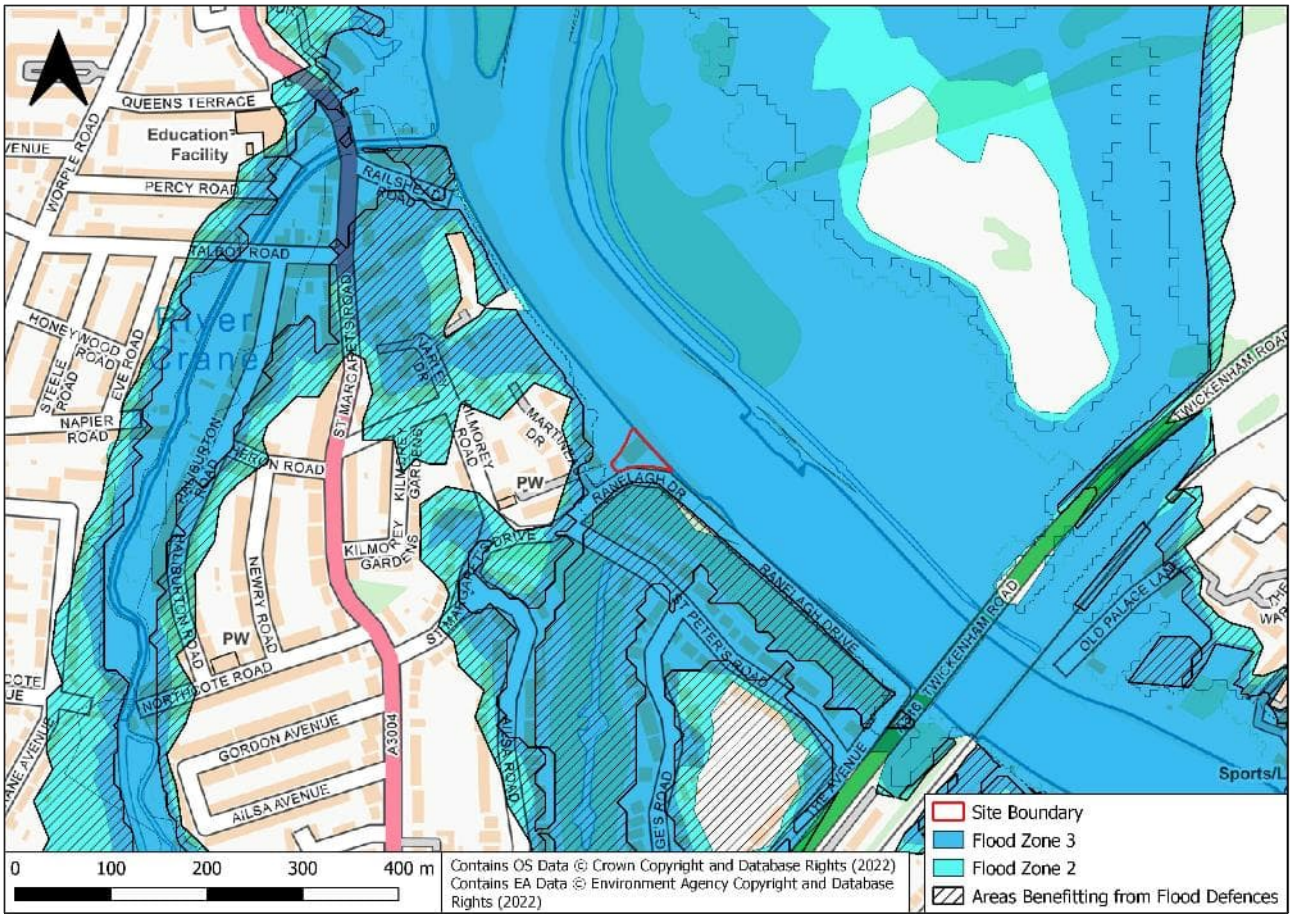
- *Zone 1 - Low Probability* (Flood Zone 1) is defined as land which could be at risk of flooding from fluvial or tidal flood events with less than 0.1% annual probability of occurrence (1:1,000 year) i.e. considered to be at 'low probability' of flooding.
- *Zone 2 - Medium Probability* (Flood Zone 2) is defined as land which could be at risk of flooding with an annual probability of occurrence between 1% (1:100 year) and 0.1% (1:1,000 year) from fluvial sources and between 0.5% (1:200 year) and 0.1% (1:1,000 year) from tidal sources i.e. considered to be at 'medium probability' of flooding.
- *Zone 3a - High Probability* (Flood Zone 3a) is defined as land which could be at risk of flooding with an annual probability of occurrence greater than 1% (1:100 year) from fluvial sources and greater than 0.5% (1:200 year) from tidal sources i.e. considered to be at 'high probability' of flooding.

- *Zone 3b - the Functional Floodplain* (Flood Zone 3b) This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:
    - land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or
    - land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

In assessing the boundary between Flood Zones 1, 2 and 3, the protection afforded by any flood defence structures, and other local circumstances, is not considered by the Environment Agency.

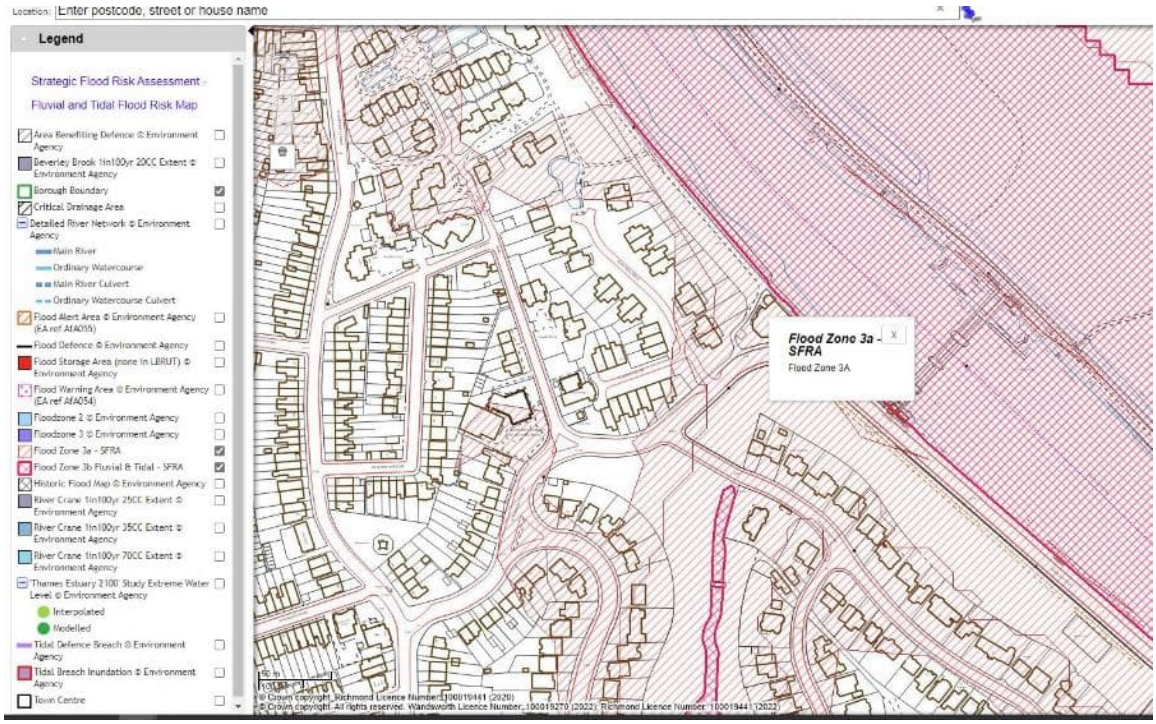
An extract of the Environment Agency (EA) Flood Map for Planning is included as Figure 3-1 which indicates the site lies within Flood Zone 3 and does not benefit from flood defences locally.

Figure 3-1
Environment Agency Flood Map for Planning



The Strategic Flood Risk Assessment undertaken by Metis Consultants (2021) for the LBRuT states that the areas of the site designated as Flood Zone 3 are in fact Flood Zone 3a. Mapping from this report, which is included below in Figure 3-2, shows that the site is located wholly within Flood Zone 3a.

Figure 3-2
London Borough of Richmond upon Thames SFRA Flood Zone Designation Mapping



We would note that the Planning Practice Guidance (PPG) for Flood Risk and Coastal Change confirms that it is the responsibility of the local planning authority (i.e. LBRuT) to define the extent of Flood Zone 3b.

The LBRuT SFRA is recent, it references the most recent available flood model outputs and was published following due consultation with the EA. This is therefore clearly the correct and most appropriate point of reference for defining Flood Zone 3b in the borough. As noted above this source places the site in Flood Zone 3a.

With reference to Table 3 of the PPG regarding flood risk compatibility, residential development (a more vulnerable development type) in Flood Zone 3a is permitted subject to the scheme passing the Exception Test.

3.3 National Planning Policy

This FRA report has been completed in accordance with the guidance presented in the NPPF[1] and with reference to PPG[2].

3.3.1 Flood Risk Compatibility

The proposed residential scheme is classified as a '*More Vulnerable'* development with regards to flood risk.

As outlined in Table 3 of the PPG guidance[2] (reproduced as Table 3-1'), 'More Vulnerable' development types are permitted in Flood Zone 3a; however the exception test must be passed.

Table 3-1
Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	x	x	x	✓

Key: ✓ Development is appropriate x Development should not be permitted

3.3.2 Sequential Test

With reference to the NPPF, the Sequential Test gives preference to locating new development in areas that are at lowest risk of flooding (i.e. Flood Zone 1). The Environment Agency Flood Map for Planning (Figure 3-1) and SFRA are geared to providing the basis for applying this test.

The Sequential Test requires developers to:

> *".....demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed."*

The site is an existing residential property which seeks to be replaced by 3 residential properties. Ultimately the development will not change the flood vulnerability of the site or have a significant impact on the number of residents.

Development is needed in riverside areas. Given its economic and cultural value locally and there is no plan to discourage river frontage residential schemes where these are appropriately designed. This is supported by policy LP 34 of the Local Plan, whereby riverside housing development in both Richmond and Twickenham is required in order to meet the boroughs new housing target.

This FRA and SWDS will ensure that the proposed residential development is appropriately designed and safe throughout its lifetime of development. On this basis we assume that the sequential test is passed.

3.3.3 Exception Test

The exception test, as set out in paragraph 164 of NPPF, states that

> *"For the exception test to be passed it should be demonstrated that:*
>
> *(a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
>
> *(b) 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.*

Both elements of the exception test should be satisfied for development for be allocated or permitted".

The development will provide additional sustainable housing within the borough in an amenity location set back from its existing location to expand and significantly improve the River Walk ecologically but also for public amenity. Wider consideration of how the scheme addresses sustainability through its design is included elsewhere within the application.

This report, a Flood Risk Assessment and Surface Water Drainage Strategy, sets out how the scheme to fulfils point b.

3.4 Local Planning Policy

The site falls within the planning jurisdiction of the London Borough of Richmond upon Thames, and therefore must satisfy the planning requirements set out in the Local Plan[13]. The Local Plan was adopted in July 2018 and sets out policies and guidance for development in the borough up to 2033. Policy LP21 relates directly to flood risk and drainage and is reproduced below.

Policy LP21 – Flood Risk and Drainage

A. *All developments should avoid, or minimise, contributing to all sources of flooding, including fluvial, tidal, surface water, groundwater and flooding from sewers, taking account of climate change and without increasing flood risk elsewhere. Development will be guided to areas of lower risk by applying the 'Sequential Test' as set out in national policy guidance, and where necessary, the 'Exception Test' will be applied. Unacceptable developments and land uses will be refused in line with national policy and guidance, the Council's Strategic Flood Risk Assessment (SFRA) and as outlined in the table below.*

In Flood Zones 2 and 3, all proposals on sites of 10 dwellings or more or 1000sqm of non-residential development or more, or on any other proposal where safe access/egress cannot be achieved, a Flood Emergency Plan must be submitted.

Where a Flood Risk Assessment is required, on-site attenuation to alleviate fluvial and/or surface water flooding over and above the Environment Agency's floodplain compensation is required where feasible.

Basements and Subterranean Developments

B. *Basements within flood affected areas of the borough represent a particularly high risk to life, as they may be subject to very rapid inundation. Applicants will have to demonstrate that their proposal complies with the following:*

Flood Zone 3a (Fluvial / Tidal)	*In areas of Extreme, Significant and Moderate Breach Hazard (as set out in the Council's SFRA):*
	• *New basements:*
	  ○ *restricted to Less Vulnerable / Water Compatible use only.*
	  ○ *'More Vulnerable' uses will only be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed. Bedrooms at basement levels will not be permitted.*
	  ○ *'Highly Vulnerable' such as self-contained basements/bedrooms uses will not be permitted.*
	• *Existing basements:*

13 Local Plan, London Borough of Richmond upon Thames, July 2018, https://www.richmond.gov.uk/media/15935/adopted_local_plan_interim.pdf

	○ *No basement extensions, conversions or additions for 'Highly Vulnerable' uses.* ○ *'More Vulnerable' uses will only be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed.* • *In areas of Low or No Breach Hazard (as set out in the Council's SFRA):* • *New basements: if the Exception Test (where applicable) is passed, basements may be permitted for residential use where they are not self-contained or used for bedrooms.* • *Existing basements: basement extensions, conversions or additions may be permitted for existing developments where they are not self-contained or used for bedrooms.* *If a basement, basement extension or conversion is acceptable in principle in terms of its location, it must have internal access to a higher floor and flood resistant and resilient design techniques must be adopted.*

Sustainable Drainage

C. *The Council will require the use of Sustainable Drainage Systems (SuDS) in all development proposals. Applicants will have to demonstrate that their proposal complies with the following:*

1. *A reduction in surface water discharge to greenfield run-off rates wherever feasible.*
2. *Where greenfield run-off rates are not feasible, this will need to be demonstrated by the applicant, and in such instances, the minimum requirement is to achieve at least a 50% attenuation of the site's surface water runoff at peak times based on the levels existing prior to the development.*

Flood Defences

D. *Applicants will have to demonstrate that their proposal complies with the following:*

1. *Retain the effectiveness, stability and integrity of flood defences, river banks and other formal and informal flood defence infrastructure.*
2. *Ensure the proposal does not prevent essential maintenance and upgrading to be carried out in the future.*
3. *Set back developments from river banks and existing flood defence infrastructure where possible (16 metres for the tidal Thames and 8 metres for other rivers).*
4. *Take into account the requirements of the Thames Estuary 2100 Plan and the River Thames Scheme, and demonstrate how the current and future requirements for flood defences have been incorporated into the development.*
5. *The removal of formal or informal flood defences is not acceptable unless this is part of an agreed flood risk management strategy by the Environment Agency.*

The London Plan[14] is the statutory development plan for the city and was updated in 2021. All London Boroughs should conform to the wider London Plan to ensure that the planning system for London reflects the overall strategy for how the city can develop in a sustainable manner. Relevant policy from the London Plan includes:

Policy SI 12 Flood risk management

A. *Current and expected flood risk from all sources (as defined in paragraph 9.2.12) 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.*

14 The London Plan, The Spatial Development Strategy for Greater London, Mayor of London, March 2021, https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

B. *Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.*

C. *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.*

D. *Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.*

E. *Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.*

F. *Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.*

G. *Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.*

Policy SI 13 Sustainable drainage

A. *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. Increases in surface water run-off outside these areas also need to be identified and addressed.*

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

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

C. *Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*

D. *Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.*

Paragraph 9.13.3 of the London Plan, which provides supplementary commentary to Policy SI 13 Sustainable Drainage, states:

> *In some cases, direct discharge into the watercourse is an appropriate approach, for example rainwater discharge into the tidal Thames or a dock. This should include suitable pollution prevention filtering measures, ideally by using soft engineering or green infrastructure. In addition, if direct discharge is to a watercourse where the outfall is likely to be affected by tide-locking, suitable storage should be designed into the system.*

The EA objected to a previous version of the scheme with reference to Richmond Local Plan Policy LP21 (See Appendix 02) due to the increased number of units and subsequent intensification of land use in Flood Zone 3b.

We note that;

1) The development proposed is within Flood Zone 3a and not Flood Zone 3b (see Section 3.2)

2) a Certificate of Lawful Development for Existing Use of the premises as three separate residential dwellings was refused in May 2017. This application as refused as the evidence presented to LBRuT, at the time, did not demonstrate that on balance of probability, the use of the premises was in three separate residential dwellings. However, this lack of evidence only related to Unit 1 (Unit 2 and Unit 3 were not of concern).

   Subsequently, a new application was submitted for Unit 2 and 3 (only) for a Certificate of Lawful Existing Use, under LPA ref. 19/0141/ES191. It was determined that Unit 2 and 3 were in residential use under C3. The officer's report stated, "on the balance of the probability, and given the fact that the Council do not have substantial evidence to suggest otherwise, the Council are satisfied that Units 2 and 3 have been continuously used as separate self-contained residential units for over 4 years".

   In terms of Unit 1, the officer's report goes onto say that an enforcement case had been opened for the "unauthorised change of use of the property into one studio flat (unit 1)". The officer's report confirms that the investigation was subsequently closed as the LBRuT Enforcement Officer conceded that "on the balance of probability, they were satisfied that the change of use had occurred 4 years before the date of their assessment (11/06/2014)". Unit 1 continues to be in residential (C3) use.

   In short, given the current tenancy circumstances, all three residential dwellings are currently in use as C3 residential dwellings.

   The proposal is seeking to replace the existing three residential dwellings with three residential dwellings, i.e. like-for-like and therefore, no intensification of the site is proposed in terms of the number dwellings on the site.

Given that the site is not in Flood Zone 3b and there is no increase in the number of units proposed on the site, the proposed scheme is clearly not contrary to Richmond Local Plan Policy LP 21.

3.5 Climate Change

In February 2016 the Environment Agency issued guidance on the impacts of climate change on flood risk in the UK to support the NPPF (last major update in May 2022[15]). This advice sets out that peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.

PPG recommends that considerations for future climate change are included in FRA's for proposed developments. The site is not located on open coast and therefore changes in relation to offshore wind speed and extreme wave heights are not applicable. The site is located along the tidal Thames frontage and therefore this assessment will consider the effects of sea level rise on tidal inflows but also fluvial flows progressing downstream. Uplifts in peak rainfall intensity on surface water flood risk will also be accounted for.

15 Environment Agency, Flood Risk Assessments: Climate change allowances, February 2016 (Updated May 2022)

3.5.1 Sea Level Change

To take into account the effects of climate change over the lifetime of the proposed development (75-years), the most recent advice on climate change provided by the EA should be applied. An extract of this advice, *Table 3 sea level allowance for each epoch in mm per year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets*, is reproduced as Table 3-2 for the south east area of England. Flood risk assessments should assess both the higher central and upper end allowances.

Table 3-2
Sea Level Allowance for each epoch in millimetres (mm) per year, with total sea level rise for each epoch in brackets (use 1981 to 2000 baseline) by River Basin District

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
South East	Higher Central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20
	Upper end	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.60

The anticipated sea level rise throughout the 100-year anticipated lifetime of development, up until 2123, is 1.17m using the higher central allowance and up to 1.57m using the upper end allowance.

In reality these uplifts relate to areas of open sea and the Thames adjacent to the site is estuarine. In such situations best practice is to apply the projected sea level rise at the downstream boundary of a tidal flood model and then use the model to assess how this impacts water levels extending up the tidal reaches. Where available the outputs of such modelling should be used in preference to simply uplifting current day estimate of extreme flood levels.

3.5.2 Peak Fluvial Flows

Peak River Flow Allowances provided by the Environment Agency show the anticipated changes to peak flows by management catchment. Guidance states that for *"more vulnerable"* development located in Flood Zone 3a the *"central"* allowance should be considered.

For the London Management Catchment, this equates to a 17% increase in peak flow by the end of the anticipated lifetime of the development, as demonstrated in Table 3-4.

Table 3-3
Peak River Flow Allowances by Management Catchment (based on a 1981 to 2000 baseline)

Management Catchment	Allowance Category	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
London	Central	10%	7%	17%

3.5.3 Peak Rainfall Intensity

The Environment Agency climate change guidance acknowledges that there is uncertainty with respect to the absolute level of change that is likely to occur with respect to rainfall, and that both the absolute level of change and the level uncertainty increase over time. As such, the document provides estimates of possible changes that reflect three different time horizons and two different emission scenarios. These recommended allowances for rainfall depths are set out in Table 3-4.

Guidance states that flood risk assessments should assess the 'Upper End' allowance to understand the range of impact for both the 1% and 3% AEP events for the 2070s epoch for a 100-year development lifetime (Table 3-4). The higher of the two allowances, which in this case corresponds to the 2070s epoch, should be accounted to assess the flood risk.

Table 3-4
Peak Rainfall Intensity Allowance in the London Management Catchment

Management Catchment	Annual Exceedance Rainfall Event	Allowance	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2070s' (2061 to 2125)
London	3.3%	Upper End	35%	35%
		Central	20%	35%
	1%	Upper End	40%	40%
		Central	20%	25%

4.0 Potential Sources of Flooding

4.1 Methodology and Best Practice

This Flood Risk Scoping Report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)[16], and British Standard BS8533[3].

A screening study has been completed to identify whether there are any potential sources of flooding at the site which may warrant further consideration. If required, any potential significant flooding issues identified in the screening study are then considered in subsequent sections of this assessment.

4.2 Screening Study

Potential sources of flooding include:

- Flooding from the sea or tidal flooding;
- Flooding from rivers or fluvial flooding;
- Flooding from surface water and overland flow;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources; and
- Flooding from infrastructure failure.

The flood risk from each of these potential sources is discussed below and summarised in Section 4.3.

4.2.1 Flooding from the Sea or Tidal Flooding

Based on mapping provided by the Environment Agency and SRFA, the site falls within Flood Zone 3a adjacent to the River Thames in its tidal reaches.

Flooding from tidal sources is therefore possible at the site and is discussed in further detail in Section 5.4.

4.2.2 Flooding from Rivers or Fluvial Flooding

The site is situated downstream of Teddington Lock which is the interface between the tidal and fluvial influences on the Thames. Whilst it is considered the reach of the Thames past the site is largely tidal in nature, high tides coinciding with extreme fluvial flooding will affect the fluvial conveyance of the Thames resulting in potentially elevated water levels past the site resulting from fluvial sources. This eventuality is largely managed through use of the Thames Barrier to prevent the flood tide during period of peak fluvial flow and minimise the potential for backwater effects.

Similarly, backwater effects / closing of the tidal lock gates during extreme fluvial flooding along the River Crane paired with extreme high tide may result in out of bank flood waters preferentially discharging to areas of lower lying land.

While of lesser concern than tidal flooding both of these fluvial influences will be reflected in the flood modelling and is therefore assessed in detail in Section 5.3.

16 Report C753, The SuDS Manual; CIRIA (2015). Report C753, November 2015.

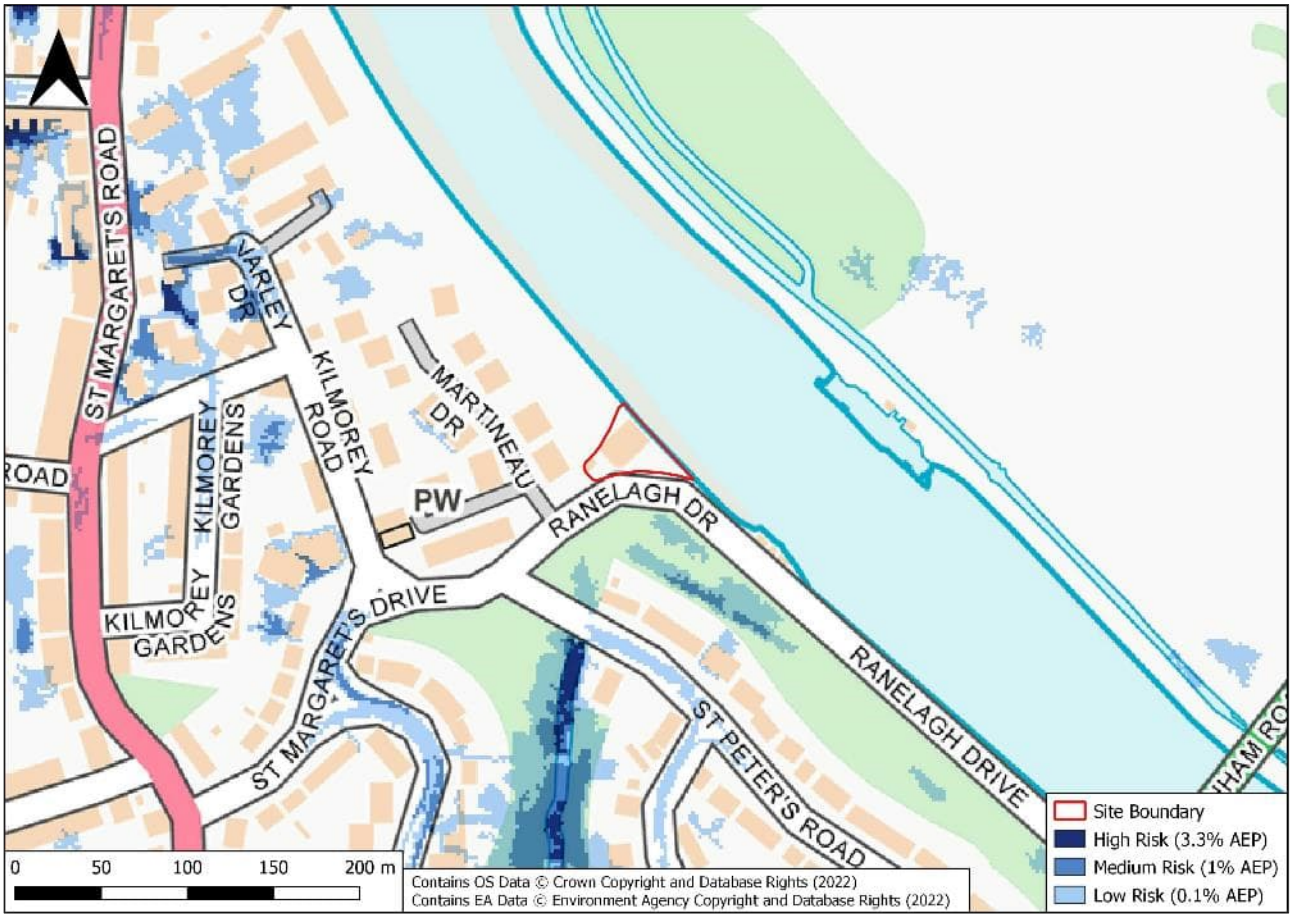
4.2.3 Flooding from Surface Water and Overland Flow

The site sits to the north of a small topographic crest resulting in a limited upgradient catchment area. Significant overland flows are therefore unlikely to propagate onto the site from this direction.

Whilst the topography of the wider area slopes north east towards the River Thames, areas to the south west are lower than the site and any overland flows would therefore pond in these depressions and not flow onto the site.

Long Term Flood Risk Information (LTFRI)[17] provided by the Environment Agency includes mapping of surface water flood risk. Surface water modelling has been undertaken by the Environment Agency in order to establish areas at risk of surface water flooding based upon latest hydrological techniques and surface terrain data. This is not representative of any surface water drainage (such as highways drainage) and therefore likely overestimates the flood risk.

Figure 4-1
Environment Agency Surface Water Flood Map



An extract of the map for the site and surrounding area is presented in Figure 4-1, where the Environment Agency define the surface water flood risk categories as:

- Very Low: less than 1 in 1,000 annual probability of flooding in any given year;

17 Environment Agency, Long Term Flood Risk Information Service: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

- Low: less than 1 in 100 annual probability but greater than or equal to 1 in 1,000 annual probability of flooding in any given year;
- Medium: between 1 in 100 annual probability and 1 in 30 annual probability of flooding in any given year; and
- High: greater than 1 in 30 annual probability of flooding in any given year.

The surface water flood mapping provided in Figure 4-1 supports the conceptual understanding that surface water flood risk to the site is very low, with elevated areas of risk in the local topographic depressions to the south and south west.

Whilst peak rainfall depths could increase by up to 40% over the projected development lifetime this will not significantly alter the risk posed to the site. Instead, it is likely that more severe rainfall would increase the frequency and severity of flooding to those areas where runoff would naturally drain to (i.e., not the site).

A surface water drainage strategy would be required from the site to ensure that runoff derived from the site is actively managed for the design 1% AEP plus 40% climate change.

The risk of flooding from surface water and overland flow is very low and not considered further.

4.2.4 Flooding from Groundwater

Groundwater flooding can be defined as flooding caused by the emergence of water originating from subsurface strata. Groundwater flooding can occur where sites are located on permeable ground. After a prolonged period of rainfall and groundwater recharge, a considerable rise in the water table can result in inundation for extended periods of time.

The site is situated on largely impermeable clay bedrock geology which would not typically give rise to groundwater flooding. More permeable alluvium and made ground deposits are present above the clay which results in perched groundwater within the shallow layers. This is supported by data from borehole records locally (Section 2.4), where groundwater strike was noted at variable depths of 2 – 3.8m bgl within the alluvium and made ground layers. During periods when river levels are high, groundwater levels are likely to approach the ground surface in areas surrounding the site. However, as the site is raised above adjacent areas, and is overlain by hardstanding, water would emerge from the lower ground to the south (open areas of vegetation) rather than result in groundwater flooding at the site surface.

Mapping contained within the SFRA indicates the site as being at risk of groundwater flooding for any subsurface development. Based on the geological conditions, we would agree with this mapping and expect shallow groundwater at the site perched above the London Clay. Actual depths to water would need to be determined post planning as part of the ground investigation works however the lower ground floor will require tanking regardless to prevent any potential groundwater ingress.

4.2.5 Flooding from Sewers and Water Mains

Thames Water Asset Plans are provided as Appendix 04 which indicate surface, foul and mains water sewers beneath Ranelagh Drive past the site.

In the event of failure or surcharge of sewerage infrastructure or burst of the water mains flood water would pond on Ranelagh Drive along the Thames frontage as this is the topographic low whereby there are no restrictions to flow. It is unlikely that the volume of flow following such an event would result in flood levels which would progress onto the site beyond the main ramped access point (depths of up to 1m required).

Flooding from sewers and water mains is low and therefore not considered further.

4.2.6 Flooding from Reservoirs, Canals and Other Artificial Sources

With reference to Environment Agency Reservoir Breach Mapping[17], the site is located partially in an area considered to be at risk of flooding from a total of 8 different reservoirs. In reality due to the raised nature of the proposed development, it is unlikely such an event would result in internal flooding of the property. However, this risk is significantly heightened, and could theoretically inundate the entire site, if a major reservoir failure occurred when there is also flooding from rivers.

Reservoirs are subject to stringent inspection and maintenance controls under the 1975 Reservoirs Act. The probability of flooding from this source is therefore near zero and integrating further mitigation works to prevent flooding in this scenario would be inappropriate. The associated flood risk is therefore not considered further in this assessment.

A review of Ordnance Survey mapping has not identified any canals or other artificial water bodies upgradient of the site. As such the risk of flooding proposed to the development from this source is assessed to be negligible and is not considered further.

4.2.7 Flooding from Infrastructure Failure

EA mapping (Figure 3-1) indicates that the site is not situated in an area that benefits from flood defences; however, the EA asset database indicates the presence of raised defences around the perimeter of the existing building. As detailed below in Section 5.2, there are gaps in this wall which therefore means that its effect in reducing flood risk to the existing site is negligible and the site would already be fully inundated should the solid wall be overtopped or fail.

Boat Lake is present to the south of the site. This receives inflows from a number of sources including surface water runoff, groundwater within the shallow gravel layers. At its northern extent, the lake is fitted with a sluice gate which is connected to the River Thames which prevents tidal water backing up into the lake. Should the sluice gate mechanism fail, tidal water would be able to back up into Boat Lake potentially resulting in flooding of the surrounding areas present behind the Thames Tidal wall. The site is however located on the riverward side of these defences and therefore this potential flood mechanism would not affect the site.

A review of the local context has not identified any other infrastructure, the failure of which could result in flooding at the site. The risk of flooding resulting from infrastructure failure is not considered further.

4.3 Summary of Flood Screening

A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 4-1.

Table 4-1
Potential Risk Posed by Flooding Sources

Potential Source	Potential Flood Risk at Site?
Sea or Tidal Flooding	Yes
Rivers or Fluvial Flooding	Yes
Surface Water and Overland Flow	No
Groundwater	No
Sewers and Water Mains	No
Reservoirs, Canals and other Artificial Sources	No

Potential Source	Potential Flood Risk at Site?
Infrastructure Failure	No

5.0 Technical Assessment of Flood Risk

The screening assessment summarised in Table 4-1 identifies potential sources of flooding from:

- Fluvial sources associated with coincidental events of:
  - Astronomical high tide coinciding with extreme fluvial flows along the Thames restricting flood flow conveyance and resulting in elevated water levels past the site due to fluvial flows.
  - Closure of the lock gates on the River Crane due to astronomical high tide coinciding with extreme fluvial flows along the River Crane causing flood water to back up into the catchment.
- Tidal sources as the site is located adjacent to tidal reaches of the River Thames.

These potential flood risks to the site are therefore assessed in further detail below. A data request was submitted to the Environment Agency to support this Flood Risk Assessment and the resulting correspondence is provided in Appendix 05.

5.1 Historical Flooding

With reference to the Environment Agency Historical Flood Mapping[18], and as confirmed in the SFRA[9] and Appendix 05, there have been no recorded historical incidents of flooding at the site. However, based on internet research of published news articles, Ranelagh Drive, which is elevated below the site, regularly floods following high tide. This is most prominently recorded following the spring high tide in March 2013. The property itself has not recorded any internal flooding.

There are also two recorded incidents of out of bank flooding along the Crane past the site in November 1965 and January 1999. This is likely a result of elevated flows within the Crane unable to discharge into the Thames due to high tide (reduction in flood conveyance) resulting in flows backing up into the upgradient catchment (the mechanism described in Section 5.1). These flood events did not affect the site.

5.2 Flood Defences

5.2.1 Thames Barrier

Water levels within the Thames adjacent to the site are dominated by downstream tidal conditions and to a small degree by fluvial flows from the upstream catchment. During major storms water can surge up the estuary and could (if not controlled) result in significant flooding within central London.

The Thames Barrier, present on the lower Thames downstream of the site, is designed to manage water levels within central London. The barrier is shut;

a) at low tide in advance of fluvial flood flows reaching central London to ensure that there is sufficient capacity to receive fluvial flows without flooding occurring; and
b) in advance of high tide when major storm surges are predicted to impact the outer Thames Estuary.

The barrier has been designed, and is maintained, to a high standard and the probability of it being unable to manage water levels as designed is estimated to be less than 1 in 1000 in any given year.

The Environment Agency currently operate the Thames Barrier to ensure that peak water levels in the Thames adjacent to the site do not exceed 5.61m aOD. They indicate that this standard will be maintained through to 2065.

18 Environment Agency Historic Flood Map, Open Data, GOV.UK, https://www.data.gov.uk/dataset/76292bec-7d8b-43e8-9c98-02734fd89c81/historic-flood-map

Beyond 2065 the Thames Barrier will still provide protection to a high standard. Changes in flood severity associated with climate change would however require increasingly frequent operation of the barrier to maintain the target water level. It is therefore envisaged that operating rules would be altered to permit higher water levels in central London and therefore provide sufficient time to maintain the system. By the end of the projected development lifetime the Project maximum water level permitted by the operations of the barrier would therefore increase to 6.30m aOD.

5.2.2 Local Defences

With reference to the Flood Defence Mapping contained in Appendix 05, the site is situated riverside to the main linear flood wall along the Thames which at present, is raised to a height of around 5.94m aOD.

A perimeter wall is also present around the site comprised of parts of the existing building (along the river front) and freestanding brick walls which, along the riverfront, have been infilled with solid ground to an equivalent level. Due to large gaps in this wall for the entrances to the property (see Figure 5-1) this structure would have no effect in managing flood risk to the existing property. Instead flood risk to the existing property is controlled by the raised floor level. Based on survey data and observations the current floor level is estimated to be at an elevation of between 5.65 and 5.85m aOD. This explains why the property has never been flooded.

Figure 5-1
Gaps in existing site perimeter wall

5.3 Flooding from Rivers and Fluvial Flooding

It is considered the site is potentially at risk of fluvial flooding from two potential flood mechanisms:

1) Astronomical high tide coinciding with extreme fluvial flows along the Thames restricting flood flow conveyance and resulting in elevated water levels past the site due to fluvial flows; and
2) Closure of the lock gates on the Crane due to astronomical high tide coinciding with extreme fluvial flows along the River Crane causing flood water to back up into the catchment.

With reference to point 1, this modelling has been included as part of the Lower Thames and Jubilee River Modelling Study which inputs a range of design fluvial flow conditions on a static downstream tidal boundary (the maximum tidal level before the Thames Barrier is closed). Flood model outputs and the associated assessment of fluvial flood risk is provided in Section 5.3.1.

With reference to point 2, the data request to the EA did not provide flood model outputs for the River Crane however, fluvial flood mapping has been incorporated into the SFRA using the River Crane SRFM Modelling and Mapping Study which will have included the effects of high tide / closure of the lock gates on flood conveyance in the lower reaches. This is discussed in Section 5.3.2.

5.3.1 Lower Thames, Jubilee River and River Ash Model

The Lower Thames, Jubilee River and River Ash Modelling Study was produced by JBA Consulting in July 2020. This study assessed flood risk along the River Thames and its main tributaries (including the Crane) between Hurley and Teddington. Output modelling data from this study was provided by the EA and provides a range of in channel flood levels past the site for both the defended and undefended scenarios across a range of return periods, including climate change uplifts on fluvial flows.

The Hammersmith reach of the model (the site) considers both fluvial flows and downstream tidal elevations with the upstream boundary scaled to represent the design flow condition on the Thames, and the downstream boundary condition using the highest tidal level in Southend whereby the Thames Barrier will not close. This model therefore explicitly analyses the effects of fluvial flows on the Thames using a static downstream tidal water level.

This modelling provides in-channel design flood levels for a range of different fluvial flood probabilities. Analysis of this data will conservatively use the defended scenario outputs for the neighbouring modelled nodes (Figure 5-2) as this represents the presence of the existing local Thames Tidal Defences behind the site. Flood model outputs for the upstream and downstream node are summarised in Table 5-1.

Figure 5-2
Model Node Locations past the site from Lower Thames, Jubilee River and River Ash Model

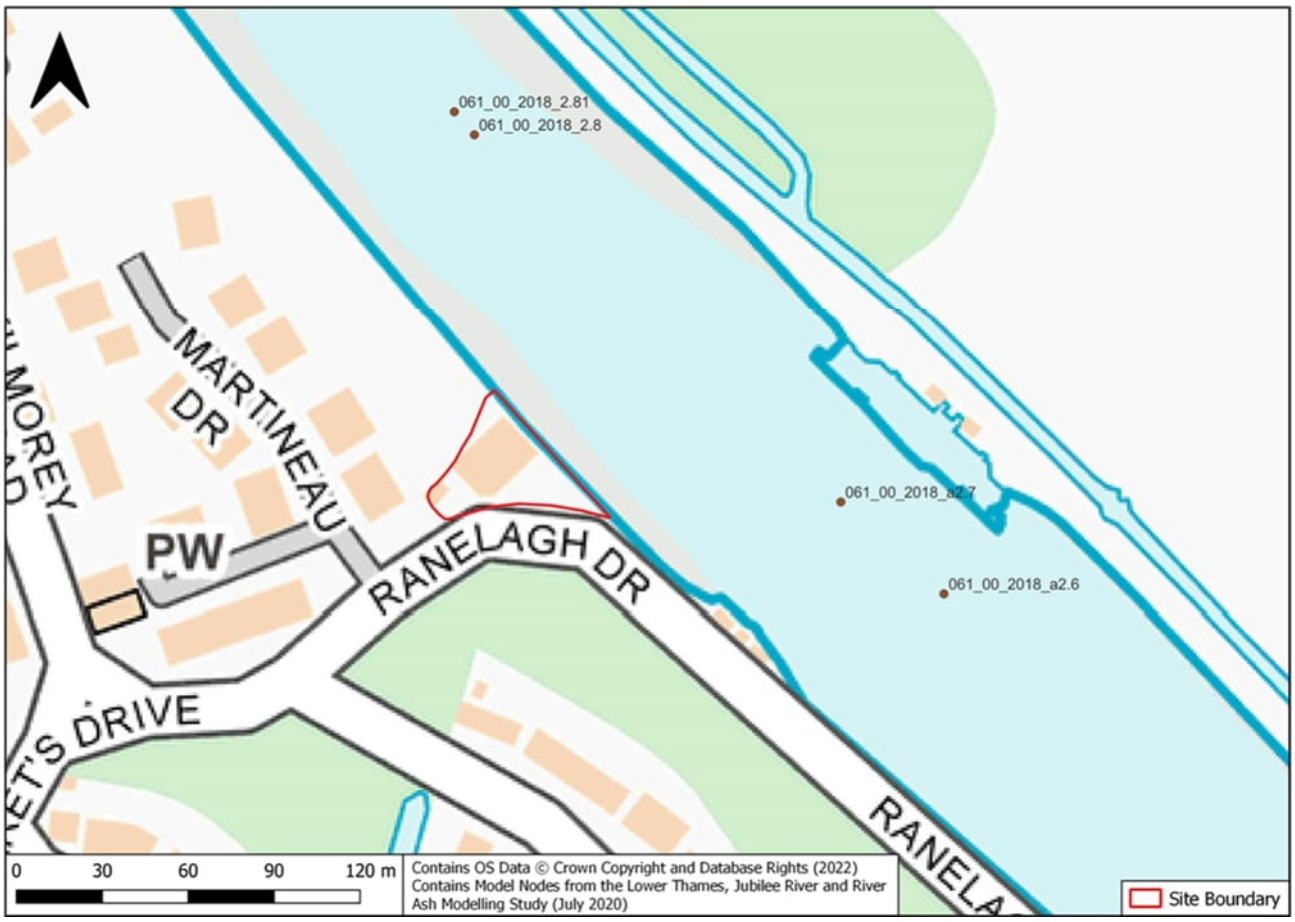


Table 5-1
Flood Model Outputs for the Lower Thames Model

Annual Exceedance Probability (%)	Modelled Node	
	061_00_2018_a2.7 (upstream)	061_00_2018_2.8 (downstream)
20% (1 in 5)	4.76	4.75
10% (1 in 10)	4.79	4.77
5% (1 in 20)	4.83	4.81
2% (1 in 50)	4.98	4.95
1.33% (1 in 75)	5.04	5.00
1% (1 in 100)	5.10	5.05
0.5% (1 in 200)	5.28	5.23
0.1% (1 in 1000)	5.71	5.62
1% (1 in 100) + 25% Climate Change	5.42	5.36
1% (1 in 100) + 35% Climate Change	5.67	5.57
1% (1 in 100) + 70% Climate Change	6.51	6.38

Based on the model outputs the low-lying land along Ranelagh Drive (elevation c.4.4m aOD) would be flooded frequently. This accords with anecdotal experience. During larger events water would approach and flood the ground on the site, but internal flooding of the existing property is not likely.

For fluvial flooding the 1 in 100 annual probability event, with an appropriate uplift in climate change, is the normal design standard for new development. Based on current guidance (see Section 3.5.2) for residential development it should be assumed that peak fluvial flows in this area will increase by up to 17% over the projected development lifetime. For the purposes of this assessment, we have therefore conservatively taken the 1 in 100 annual probability event plus 25% climate change allowance as the design event. Using the upstream model note (061_00_2018_a2.7), this equates to a design fluvial flood level of 5.42m aOD.

5.3.2 River Crane

Modelled flood outlines along the River Crane included in the SFRA and derived as part of the Lower Thames Model confirm the site is not at risk of fluvial flooding from the River Crane for all events up to and including the 1 in 100 annual probability event plus 70% climate change.

5.4 Flooding from the Sea and Tidal Flooding

The flood risk screening has identified that the site is potentially at risk of flooding from tidal sources. The site is situated along the tidal Thames frontage in an area designated as Flood Zone 3a and is not afforded protection from flood defences locally.

5.4.1 Thames Estuary 2100 Model

The Thames Estuary 2100 (TE2100) model provides the maximum likely water level past the site under a defended scenario following closure of the Thames Barrier. These outputs are summarised below in Table 5-2 across a range of epochs. As discussed in Section 5.2, the operation of the Thames Barrier will change over time in response to climate change, resulting in a high maximum possible tidal water level at the site.

Table 5-2
Flood Model Outputs from TE2100 Model

Node	Present Day Water Level (m aOD)	Future 2065-2100 Water Level (m aOD)	Future 2100 Water Level (m aOD)
a2.7	5.61	5.85	6.30

Using the modelled data in Table 5-2, it is understood that, under a present day extreme tidal scenario, all internal areas would remain flood free however the yard area to the west and rear of the property would be inundated, with flood depths of up to 1.15m at the vehicle access point (4.46m aOD) along Ranelagh Drive.

The TE2100 modelling has considered changes to the maximum likely water level as a consequence of climate change. It is envisaged that by 2100, the maximum likely water level in the Thames past the site will be at around 6.3m aOD. This is 0.88mm above the projected fluvial flood level and is therefore the adopted design flood level at the site.

5.5 Finished Floor Levels

As discussed in Section 5.4.1, the design flood level for the site is 6.3m aOD using the 2100 water level from the TE2100 tidal model. This is above the modelled 1 in 100 plus 25% (note allowance is only 17%) climate change fluvial flood level at 5.42m aOD.

Following pre-application discussions with the Environment Agency the proposed threshold level for the property is 6.90m aOD; 500mm above the design flood level in this assessment. The finished floor level of the building is however lower at 6.01m aOD. All aspects of the building below 6.90m aOD will be of flood resilient construction, with any vented areas fitted with valves to inhibit flood water ingress. As a result, the probability of internal flooding of the property is very low.

External ground levels on the site would be re-profiled to a platform level of 5.10m aOD which would mean that occasional flooding in this area will be possible.

5.6 Flood Compensation

The site falls within the active Thames fluvial floodplain and therefore any raising of ground levels could result in a loss of flood storage. Any such losses must be offset by providing compensation elsewhere up to the design fluvial flood level of 5.42m aOD.

We note that flooding up to the design fluvial flood level of 5.42m aOD would not result in internal flooding of the existing main building. As such the internal areas of that building are not currently available for flood storage. The footprint of the building protected from flooding will be increased through development. A loss of flood storage will however be avoided because;

- the building footprint will not be significantly changed as a result of the development (see Appendix 07);

- the external ground levels to the rear (away from river) of the property will be lowered from the existing by the development; and
- the site boundary wall will be moved away from the river and the additional land between the new wall and the river will be lowered to the level of the riverside walk.

Analysis of fluvial flood storage to the design flood level of 5.42m aOD has been undertaken. Pre and proposed ground levels are provided as Appendix 06, with the flood storage calculations summarised in Table 5-3 below.

Table 5-3
Level for Level Flood Storage Compensation Analysis

Elevation Band	flood storage (m^3)		
	current	proposed	change
5.32m aOD - 5.42m aOD	58.00	62.34	+ 4.34
5.22m aOD - 5.32m aOD	33.09	62.34	+ 29.25
5.12m aOD - 5.22m aOD	11.89	58.03	+ 46.14
5.02m aOD - 5.12m aOD	6.36	28.78	+ 22.42
4.92m aOD - 5.02m aOD	4.50	18.25	+ 13.75
4.82m aOD - 4.92m aOD	3.20	13.85	+ 10.65
4.72m aOD - 4.82m aOD	2.18	8.38	+ 6.20
4.62m aOD - 4.72m aOD	1.37	6.81	+ 5.44
4.52m aOD - 4.62m aOD	0.72	6.04	+ 5.32
4.42m aOD - 4.52m aOD	0.14	5.05	+ 4.91
4.32m aOD - 4.42m aOD	0.02	4.16	+ 4.14
4.22m aOD - 4.32m aOD	0.00	1.92	+ 1.92

The level for level flood storage analysis shows that through the site redevelopment, the total available flood storage volume to the design fluvial flood level of 5.42m aOD will be increased by a total of 154.48m^3. It also demonstrates that flood storage will be increased in every level from the minimum ground elevation on the site up to the design fluvial flood level.

5.7 Access and Egress

As demonstrated in the scheme masterplan (Appendix 01), all access and egress from the site will be provided off Ranelagh Drive.

The proposed development will not alter the prevailing flood risk to Ranelagh Drive (no changes in road levels) or drop site levels below the height of the road (where flood flows would then preferentially pond). As such following redevelopment, the flood hazard along the access route will be no worse than it currently is.

Ground levels along Ranelagh Drive out of the access and egress point are at around 4.4m aOD and increase gradually towards the south west. Based on a design flood level of 6.3m aOD, this gives a maximum flood depth of 1.9m. This would clearly not be safe to traverse.

5.8 Flood Resilience Measures

The Environment Agency objected to a previous version of the scheme on the basis that section drawings of the site do not include the flood defence line. These drawings are therefore provided as Appendix 08.

We would note that, as detailed in Section 5.2.2, the existing flood defence line, which appears on the Environment Agency asset mapping, included the wall of the existing property. This offers no protection to off site areas and any flood protection will be afforded measures incorporated into the proposed scheme design.

As the existing building wall is a designated flood defence, these works will need to be subject to flood risk activity permit which is distinct and in addition to planning approval. This more detailed submission would be undertaken post planning and will provide an ongoing opportunity for the Environment Agency to guide and influence these works.

A number of flood resilience measures will be required in the scheme design to reduce flood risk. These measures will ensure all internal areas remain flood free throughout the proposed lifetime of development. The required measures are summarised below:

5.8.1 Development Levels

It is proposed that through the redevelopment of the site;

- The existing building, including the boundary wall that is the designated flood defence, is demolished,
- A new raised and engineered threshold to a height of 6.9m aOD is created at the boundary to the new properties; and
- The minimum finished floor level for habitable areas of the properties is raised to 6.01m aOD.

The proposed ground floor finished floor level of 6.01m aOD is 1.41m higher than the lowest current habitable floor level on the site which is at 4.6m aOD (5.65 to 5.85m aOD is the threshold which would currently need to be exceed for flooding to occur). As such, irrespective of any other measures, this will reduce the probability of internal flooding.

Whilst the finished ground floor level is set at 6.01m aOD, the proposed engineered threshold level is 890mm above this at 6.9m aOD. This will ensure the internal areas of the building remain flood free to this level, which is 600mm beyond the design tidal flood level locally.

Raising the finished floor levels beyond 6.01m aOD is not achievable at the site because there are Metropolitan Open Land (MOL) and heritage considerations on how high the roofline of the property can extend. It is also not possible to reduce the floor to ceiling clearance height and comply with building regulations. We would further note that the principle employed in the proposed scheme was agreed with the Environment Agency at the pre-application stage.

5.8.2 Sealed to Ingress

Noting that the ground floor of the properties (6.01m aOD) and the non-habitable lower ground floor (3.10m aOD) will be set below the design food height (6.3m aOD), deliberate steps will be made to check and ensure the property is sealed to ingress in all ways up to the threshold level of 6.9m aOD.

- The building and specifically the lower ground floor construction will need to accommodate the hydrostatic pressures caused by flood water around the building (including groundwater); and
- All subsurface development (lower ground floor) will need to be lined to prevent groundwater ingress.
- No air vents or windows will be permitted below 6.9m aOD; and

- Non return valves provided both at the outlet from the individual units into the foul drain and also at the site level within a manhole on the site. A plan showing the indicative location of these valves is appended (Appendix 09; however, their final location and specification will be confirmed post planning as part of the Building Regs stage design.

The non-return valves will be inspected (and if required repaired / replaced) annually as part of a wider site and property management plan. Given the dual protection proposed (i.e. 2 valves need to fail before flooding is possible) and a robust programme of monitoring and maintenance, the probability of flood water ingress via the foul drainage network is negligible.

The SuDS system (Section 6.0) will also include a non-return valve to prevent tidal water backing up into the site drainage network through the local sewerage network. The storm water system will however all be exterior to the 6.9m aOD raised threshold and so this valve will have no function in protecting the internal areas of the proposed properties. Instead, the valve on the SuDS system is intended to ensure that sufficient space exists within the site storm water drainage network to receive and accommodate runoff without surcharge during periods of tide lock when the sewer cannot freely discharge to the Thames.

5.9 Flood Response

While measures to minimise the flood risk posed to future residents are incorporated into the proposed design of the site (i.e., raised finished floor levels), the site will become an island during any major fluvial or tidal flood event along the River Thames and access onto and egress from the site would be hazardous during all major flood events.

Given this, it is essential that the site prepares, maintains, and implements a robust Emergency Flood Response Plan (EFRP) that sets out actions to minimise the risk posed to residents and infrastructure. As the proposal is for less than 10 residential properties (see Section 3.4 and policy LP21) a draft of this plan has not been prepared for planning. This plan would however be prepared post planning and prior to occupation of the site. This would be secured by way of a planning condition.

The EFRP will include the following:

- details of roles and responsibility for maintaining, updating, and implementing the plan;
- overview of the local flood risk;
- details of the Environment Agency flood warming service locally;
- adaptation and requirements for the properties to ensure that they provide a safe point of refuge (should this be required);
- specific actions that will be undertaken in response to the issuing of a flood alert or flood warning;
- recommendation concerning evacuation of the site; and
- details of access and egress routes onto the site for periods in advance and during a flood event.

As noted above this plan would be prepared post planning and would be finalised and implemented prior to occupation of the site. Responsibility for the plan would rest with a site management company paid for through annual property service charges. Adherence to the plan would form part of the induvial property deeds for each residential unit.

6.0 Surface Water Drainage Strategy

This surface water drainage strategy sets out high level principles for managing storm water on the site in line with best practice and the requirements of the London Borough of Richmond upon Thames, the LLFA for the area.

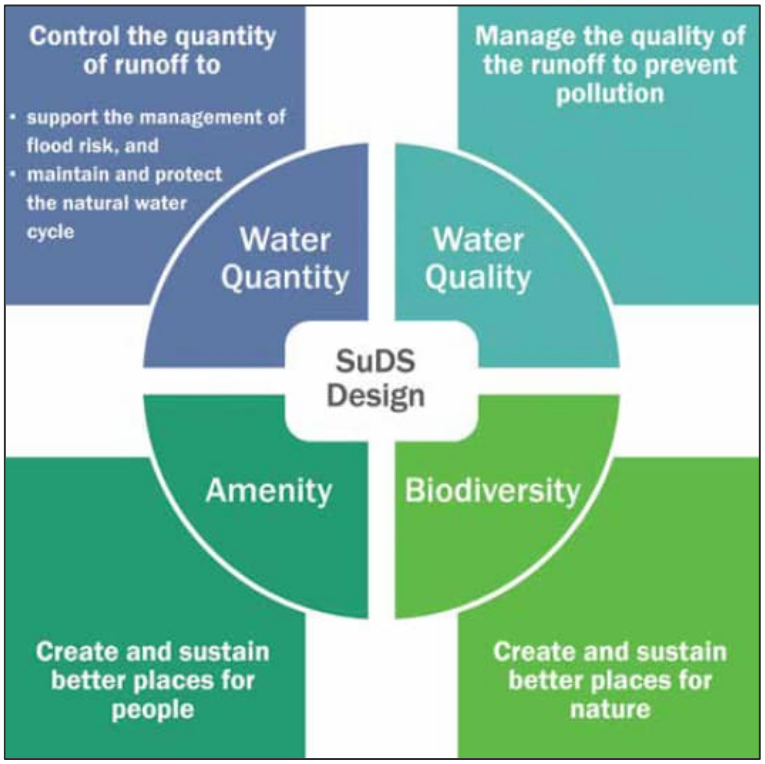
This strategy is intended to demonstrate that, given the nature and quantum of development proposed, it will be feasible to drain the site in line with planning requirements using one of the proposed methodologies.

The London Borough of Richmond upon Thames SuDS pro-forma is attached as Appendix 10 to support this SuDS application.

6.1 Key Principals of Surface Water Management

Current best practice guidance document; The Sustainable Drainage System (SuDS) Manual (CIRIA Report C753)[19], promotes sustainable water management through the use of SuDS. There are four main categories of SuDS which are referred to as the 'four pillars of SuDS design' as depicted in Figure 6-1.

Figure 6-1
Four Pillars of SuDS (extract from CIRIA Report C753)



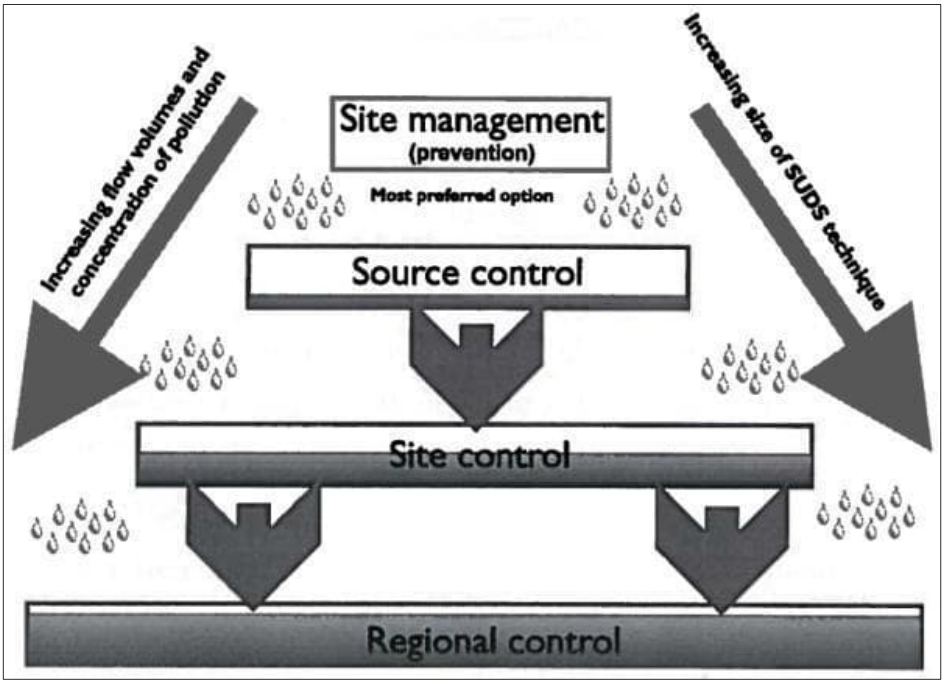
The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train'. The hierarchy of techniques is identified as:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).

19 Report C753, The SuDS Manual; CIRIA (2015). Report C753, November 2015.

- Source Control – control of runoff at or very near its source (such as the use of rainwater harvesting).
- Site Control – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).
- Regional Control – management of runoff from several sites, typically in a retention pond or wetland.

Figure 6-2
SuDS Management Train



It is generally accepted that the implementation of SuDS, as opposed to conventional drainage systems, provides a number of benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open spaces and wildlife habitat; and replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

6.2 Existing Surface Water Drainage Regime

Based on information provided on the topographic survey (Appendix 03) and wastewater asset plans provided by Thames Water (Appendix 04), surface water runoff from the existing site is intercepted by a number of drainage gullies and manholes which convey flows towards a Thames Water Surface Water sewer beneath Ranelagh Drive. This sewer conveys all flows in a north eastward direction to outfall into the Thames.

During periods of high tide it is likely that the surface water sewer outfall becomes surcharged and therefore stormwater is unable to discharge from the sewer into the Thames. Under such circumstances, surface water will surcharge from the drainage manholes/gullies on site and flow overland in line with local topography to the east onto Ranelagh Drive, or northwards via the existing pedestrian access point onto the Thames footpath of which both would result in flows discharging into the Thames.

6.3 Constraints on the Use of SuDS

6.3.1 Hydrology and Flood Risk

External areas of the site are situated within Flood Zone 3 (finished level of 4.47m aOD) and whilst SuDS features should not typically be located in areas designated as Flood Zone 3 (as any SuDS would become overwhelmed by flood water), attenuation is not required as the site sits in a predominately tidal setting.

This however means that during periods of high tide stormwater from the site may be unable to discharge away via the sewer network as this has consequentially become backed up. In order to counter this, storage will only be provided on the site for the volume of rainfall which would be anticipated following a 4-hour surcharge (tidal) event. Should tidal flood water progress onto the external area of the site this would also be captured in the remaining storage and would then discharged away accordingly once river levels subside.

6.3.2 Geology and Hydrogeology

The site is underlain by a combination of made ground, alluvium and clay bedrock. As such we would expect shallow groundwater perched within the more permeable made ground and alluvium deposits which to some degree, will vary with the tide. Using the estimated groundwater level of 3.7m aOD (Boat Lake) it would not be possible to achieve a 1m differential between the maximum groundwater level and the base of any SuDS features considering all external areas on site are elevated to 4.47m aOD.

6.3.3 Spatial Constraints

There is no available open space within the proposed development masterplan which is not essential for the proposed residential use or biodiversity / amenity purposes. This means that surface SuDS features cannot be implemented and drainage infrastructure must be at or below the external ground level.

In line with the requirements of the London Plan[14], it is recommended that all new developments should, where possible, include blue or green roofs within the design. Blue roofs are typically used to provide attenuation storage which is not required at this site. Areas of flat roof within the proposed development masterplan will therefore be laid with a sedum / green roof which slowly conveys incidental rainfall towards the drainage outfall but primarily forms an amenity and biodiversity feature.

6.3.4 Rainwater Harvesting

Rainwater butts will be installed on downpipes to the rear of the building for ‘non-potable’ external uses such as irrigation of soft landscaping / vegetative planting etc. This will reduce mains water usage and also the net volume of storm water discharging from the site.

For the purposes of the surface water drainage strategy the precautionary principle has been adopted whereby no (beneficial) allowance for rainwater re-use has been factored into the calculations or design at this stage. This therefore represents a situation where the rainwater butts are full at the start of the storm event.

6.4 Proposed Discharge Arrangement

With reference to the SuDS Manual, the hierarchy of preferred disposal options for surface water runoff from development sites in decreasing order of sustainability is as follows:

1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

Policy SI 13 Sustainable Drainage in the London Plan[14] extend this and specifies a more detailed drainage hierarchy that must be applied to all SuDS schemes within Greater London. This is reproduced below.

> *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
>
> *1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*
> *2) rainwater infiltration to ground at or close to source*
> *3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
> *4) rainwater discharge direct to a watercourse (unless not appropriate)*
> *5) controlled rainwater discharge to a surface water sewer or drain*
> *6) controlled rainwater discharge to a combined sewer*

Table 6-1 summarises the applicability of the rainfall disposal methods at the site.

Table 6-1
Suitability of Surface Water Disposal Methods

Surface Water Disposal Method (in Order of Preference)	Suitability Description	Method Suitable? (Y / N)
Reuse of Rainwater	Rainwater harvesting methods are applicable at the site for non-potable uses only. The development masterplan shows areas of flat roof which would be suitable for use as a green roof (attenuation not required as provided by a blue roof). Downflows from the roof will be stored within water butts for irrigation purposes.	Y
Infiltration	Due to elevated groundwater levels and made ground deposits, infiltration of surface water flows is unlikely. Infiltration testing is not possible at present as this would involve demolishing the formidable concrete plinth at the site.	N
Green Infrastructure	Areas of flat roof at the site are provided in the scheme design to allow for the	Y

Surface Water Disposal Method (in Order of Preference)	Suitability Description	Method Suitable? (Y / N)
	development of a green roof with gradual release of runoff to both water butts and the proposed drainage system.	
Surface Water Discharge	The site is located on the riverfront of the Thames however a new piped outflow connection would result in significant earthworks on the channel bank. There are other more preferable ways of discharging water into the Thames without considerable construction works.	N
Surface Water Sewer	Thames Water Asset plans (Appendix 04) identify a surface water sewer / box culvert beneath Ranelagh Drive which outfalls into the Thames. Existing on-site flows discharge into this feature, and the existing connection could be reutilised as part of the new development.	Y
Combined Sewer	There are no combined sewers in the vicinity of the site. There is however a foul sewer beneath Ranelagh which conveys flows south west away from the site.	N

6.5 Catchment Area Schedule

The development proposals which are provided in Appendix 01 indicate the scheme will construct a new perimeter wall. This means that all incidental rainfall onto the will discharge into the SuDS features rather than offsite and into the Thames. Runoff from the raised platform area and planting along the Thames frontage will be under drained (effectively impermeable) and conveyed towards the on-site drainage.

Development at the site is a combination of both hardstanding and soft landscaping areas and in order to accurately represent the effective impermeable areas drained, runoff coefficients have been applied to both permeable and impermeable areas. This therefore accounts for rainfall in exceedance of the soil saturation capacity of which the remainder of flows would discharge into the drainage system.

A runoff coefficient of 1.0 has conservatively been applied to all hardstanding areas and therefore does not account for potential losses through evaporation. Additionally, a coefficient of 0.45 has been applied which is considered to replicate the soil conditions based on the relatively impermeable geology / made ground locally (see Section 2.3).

An urban creep allowance of 10% has been applied to external hardstanding areas to account for small changes to the landscaping throughout the lifetime of development. The urban creep would effectively remove some of the soft landscaping areas as demonstrated in Table 6-2.

Table 6-2
Contributing Catchment Areas

Land Use	Area (ha)	Area + 10% Urban Creep (ha)[1]	Effective Impermeable Area (ha)
Roof Areas	0.0470	0.0470	0.0470
External Hardstanding	0.0470	0.0517	0.0517
Soft Landscaping	0.0235	0.0188	0.0085
Total	0.1175	0.1175	0.1072

1. Urban creep allowance is only applied to external hardstanding areas.

6.6 Conceptual Surface Water Drainage Strategy

All surface water runoff from the site will discharge into the tidal Thames at unrestricted rates via the very short length of Thames Water sewer beneath Ranelagh Drive. For purposes of this assessment, it is conservatively assumed that this sewer is in full hydraulic continuity with the Thames (i.e., no external or internal valves or tidal flaps to prevent the upsurge of water). This means that during periods of high tide, water within the Thames is able to back up into the sewer preventing discharge of stormwater for a maximum period of approximately 4 hours (one third of tidal cycle across high tide).

In line with paragraph 9.13.3 of the London Plan, attenuation is not required on the site as high discharge rates into a tidal waterbody have a negligible effect on the receiving water levels. However, during periods of high tide, the sewer outfall will become surcharged, and stormwater will be unable to freely discharge from the site. Storage will therefore be provided for the volume of runoff anticipated for the site during a 1 in 100 year plus 40% climate change rainfall event across a period of 4 hours.

This storage will be provided through the widespread use of permeable paving across the site and a below ground tank system. Both of these features would be lined to prevent groundwater ingress. In the event of on-site flooding, flood water would overwhelm the drainage system. The impact on site runoff on flooding locally under these conditions (i.e. when the area is already in flood) would be negligible.

A non-return valve will be installed on the outfall from the tank to prevent stormwater within the sewer backing up onto the site prior to surface flooding occurring.

Outflows from the green roof will discharge into rainwater butts for non-potable external uses however once full, stormwater will be overflow (formally) and drain into the subbase of the paving.

A conceptual surface water drainage strategy drawing is provided as Appendix 11.

6.7 SuDS Attenuation Storage

During coincidental high tide and extreme rainfall events, stormwater from the site would be unable to discharge into the receiving sewer and would instead back up into the permeable paving provided on site. It is envisaged that the maximum duration of sewer surcharge would be around 4-hours (one third of tidal cycle over high tide) and therefore the storage volume available must provide the equivalent volume of rainfall for the design, 1 in 100 year annual probability event plus 40% climate change event onto the site during this period.

The Simplified Rational Method has been used to estimate the volume of rainfall falling onto the site during the design 4-hour 1 in 100 year plus 40% climate change event. To be conservative a runoff coefficient of 1.0 has been applied for the drainage design.

The following equation has been used:

$$Q = ciA$$

Where Q is the runoff rate; c is the runoff coefficient[20], i is the rainfall intensity[21] and A is the impermeable area[22]. The results are then summarised in Table 6-3.

Table 6-3
Surface Water Drainage Volumetric Requirements

Rainfall Event	Duration (hours)	Rainfall Depth (mm)	Runoff Rate (l/s)	Attenuation Volume Required (m^3)
1 in 100 plus 40% climate change	4	96.4	7.2	103.4

As detailed in Table 6-3, a total volume of 103.4m^3 is required within the drainage system on site. Whilst this has not been explicitly modelled, the construction of the permeable paving is as follows:

- Cover Level 5.10m aOD
- Invert Level: 4.65m aOD
- Surface Area: 322m^2
- Membrane Depth: 150mm
- Depth of Gravels: 300mm
- Void Ratio: 0.3
- Volume Available: 29m^3

Typical construction of the attenuation tank is provided below:

- Cover Level: 5.1m aOD
- Soffit Level: 4.3 m aOD
- Invert Level: 3.0 m aOD
- Surface Area: 62m^2
- Volume Available: 74.4m^3
- Invert Level of Receiving Sewer: c.1.3m aOD (typical cover levels of this sewer based on manhole data is around 3m from invert level)

The combined use of permeable paving and a tank provides 103.4m^3 of storage which is sufficient for the 4-hour 1 in 100 year plus 40% climate change rainfall event.

20 Runoff coefficient 1.0 used for effective impermeable areas.

21 For a 4-hour storm duration using the flood estimation handbook web service, FEH 2013 DDF modelling.

22 Effective impermeable area of 0.1072ha.

6.8 Exceedance

In the event of exceedance of the surface water drainage strategy, albeit by flood water from the Thames or extreme rainfall in excess of the design event, water would discharge from the site via Ranelagh Drive to the east. From Ranelagh Drive, water would progress in an eastward direction along the road to discharge into the River Thames.

In some instances, such as flooding as a consequence of overtopping the Thames, flood water may pond on the site for longer durations however these flows would still dissipate from the site following the same exceedance route.

6.9 SuDS Assessment of Water Quality

SuDS can provide a number of water quality and amenity benefits. This surface water drainage strategy utilises a green roof and permeable pavement for treatment of surface water flows prior to discharge. Tanks do not offer any water quality treatment.

The simple index method as outlined within the SuDS Manual provides a way of quantifying the benefit to water quality of the SuDS Management Train. The pollution hazard from the land use and the mitigation from the SUDS component are each assigned an index. The total mitigation index must be greater than the pollution hazard index for adequate treatment to be delivered.

Total SuDS mitigation index ≥ pollution hazard index

(for each contaminant type) (for each containment type)

The total SuDS mitigation is the summation of the first components mitigation index and half the mitigation index of any subsequent component.

With reference to the SuDS Manual, post-development surface water runoff generated from residential roofs and low traffic roads is considered to have a 'very low' and 'low' *Pollution Hazard Level* respectively as presented Table 6-4.

Table 6-4
Pollution Hazard Potential for the Proposed Development

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	*Metals*	*Hydro-Carbons*
Residential Roofs	Very Low	0.2	0.2	0.05
Car Park / Low Traffic Road	Low	0.5	0.4	0.4

The proposed drainage system is required to demonstrate sufficient treatment capability to manage the specified Pollution Hazard Indices. The SuDS mitigation indices for the Proposed Development is provided in Table 6-5.

Table 6-5
SuDS Mitigation Indices for the Proposed Development

SuDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	*Metals*	*Hydro-Carbons*
Green Roof[1]	0.6	0.5	0.6
Permeable Pavement	0.7	0.6	0.7

2. Dense vegetation underlain by soil with good contaminant potential.

Table 6-6 compares the SuDS Mitigation Indices, provided by the proposed 'Source Control', 'Conveyance' and 'Site Control' measures against the Pollution Hazard Indices.

Table 6-6
SuDS Performance: Water Quality Indices Assessment

Land Use	Pollution Hazard Level	*Pollution Hazard and SuDS Mitigation Indices Comparison*					
		Total Suspended Solids (TSS)		*Metals*		*Hydro-Carbons*	
		Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index
Residential Roofs	Low	0.2	0.6	0.2	0.5	0.05	0.6
Low Traffic Access Roads	Low	0.5	0.7	0.4	0.6	0.4	0.7

As the SuDS Mitigation Index provided by the proposed SuDS measures are ≥ Pollution Hazard Index the water quality assessment criteria are satisfied for the site.

6.10 SuDS Operation and Maintenance

A full SuDS maintenance plan would be produced as part of the detailed drainage design post-development and the precise requirement would depend on manufacture specification of the final design. At this time, it is considered that the maintenance of the drainage network would be undertaken by a third-party management company funded by ground rent contributions from the property owners.

An outline of the typical maintenance requirements of the proposed SuDS features is provided below.

6.10.1 Green Roof

The anticipated maintenance and management for a green roof associated with the surface water drainage system is outlined in Table 6-7.

Table 6-7
Typical Green Roof Maintenance Requirements

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

6.10.2 Permeable Pavement

The anticipated maintenance and management for Permeable Pavement associated with the surface water drainage system is outlined in Table 6-8.

Table 6-8
Typical Permeable Paving Maintenance Requirements

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

Maintenance Schedule	Required Action	Minimum Frequency
	Monitor inspection chambers.	Annually

6.10.3 Tank

The anticipated maintenance and management for the tank associated with the surface water drainage system is outlined in Table 6-9.

Table 6-9
Typical Tank Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and / or internal forebays	Annually, or as required
Remedial Actions	Repair inlets, outlet, overflows, and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside tank for sediment build up and remove is necessary	Five yearly, or as required

7.0 Conclusions

SLR Consulting Limited (SLR) has been appointed by The Boathouse Twickenham Ltd to provide a Flood Risk Assessment and Surface Water Drainage Strategy to support a full planning application for the demolition of the existing building and the construction of a residential scheme comprising 3 properties with associated hardstanding and soft landscaping at The Boathouse, Ranelagh Drive, Twickenham, TW1 1QZ.

7.1 Flood Risk

A screening was undertaken which evaluated the potential flood risk from a range of sources to the site. This identified flood risks from both fluvial and tidal sources associated with the River Thames.

Using hydraulic modelling provided by the Environment Agency of the Lower River Thames, the design fluvial flood level, 1 in 100 annual probability plus 25% climate change event, is estimated at 5.42m aOD. The TE2100 tidal flood model also provides in channel flood levels for the maximum likely water level past the site. This flood level is much greater at 6.3m aOD from 2100. The design flood level of 6.3m aOD has therefore been adopted at the site.

The scheme proposals have been developed following a pre-app with the Environment Agency and therefore flood resilience and mitigation measures have been implemented into the scheme. The entrance level of the ground floor properties will be raised to 6.9m aOD which is 600mm above the design flood level. All areas of the building below this level will be seal to ingress (from surface and groundwater sources). This will ensure all internal areas of the property will remain flood free throughout the lifetime of development.

The footprint of the proposed building within the development is slightly greater than the currently dwellings. External ground levels will however be reprofiled and the Thame pathway widened. These measures will ensure there is no loss in the available fluvial flood storage at the site.

There are no proposed changes to Ranelagh Drive and ground levels for the parking area on the site will be set at 5.1m aOD. Consequently, the flood hazard associated with access and egress from the site during periods of flooding remains high, the same as for the current property on the site. Post planning, an Emergency Flood Response Plan will be prepared and implemented. This will sets out actions to minimise the risk posed to residents and infrastructure and ensure that the site is evacuated prior to flooding occurring

7.2 Surface Water Drainage

Surface water drainage has been developed at the site in line with the national and local policy requirements. The site is situated riverfront to a tidal waterbody and therefore there is no requirement for restricted discharge rates. All flows from the site will discharge into the tidal Thames via a short length of Thames Water Sewer beneath Ranelagh Drive.

During periods of extreme high tide, which should last less than 4 hours, the sewer will become surcharged, and stormwater flows from the site will not be able to freely discharge. Storage has therefore been provided within the scheme for all runoff which is shed from the effective impermeable areas during a 4-hour 1 in 100 year plus 40% climate change storm event. This equates to an approximate volume of 100.8m^3 which will be provided through the use of permeable paving across all external hardstanding areas, and a below ground tank. A pipe from the tank into the sewer will be fitted with a non-return valve to prevent flows from backing up into the site.

A green roof will also be provided on areas of flat roof of each property which discharges into rainwater butts for non-potable uses. Once the rainwater butts are at capacity, excess flows will be re-routed into the permeable paving.

The surface water drainage scheme successfully satisfies the requirements of the simplex index method through the use of green roofs and permeable paving. Residual events in exceedance of the drainage strategy have also

been considered with all flows discharging overland in line with topographic gradients along Ranelagh Drive to the east and then north into the Thames.

While the strategy implemented follows all required SuDS principles, in common with most drainage strategies put forward in support of planning applications, the scheme presented here will need to be subject to detailed design before construction commences.

APPENDICES

Appendix 01: Proposed Development Masterplan

River Thames

River side walk

River wall access point opened up and increased from 1427mm to 2600mm

Existing

Proposed

Line of Existing Boundary Wall

Existing trees retained

Line of Existing Boundary Wall

House 01

House 02

House 03

FFL : 4.8

FFL : 4.8

New permeable Path

Existing wall rebuilt to existing wall height

FFL : 5.1

FFL : 5.1

Car Park 05

Car Park 06

FFL : 5.1

FFL : 5.1

FFL : 5.1

Open gantry steps up to each property door threshold @ 6.9 datum

Bin Store

Bins

Line of 1st floor / 2nd floor above

Car Park 04

26569

Car Park 03

Bin Store

3000

FFL : 5.1

Bins

Pedestrian entrance

Cycle Store

Cycles Store

Site entrance maintained
New sliding gate.
Entrance Kerb unaltered

Car Park 02

Car Park 01

New permeable Path

Proposed Site Plan

Scale @ 1:100

Scale Bar

0 1m 2m 3m 4m 5m 10m

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS
P4	31.05.2023	PLANNING ISSUE	CJB

Client: SILVER JETTY LIMITED

Project title: The Boathouse

Project address: Ranelagh Drive, Twickenham, TW1 1QZ

Drawing title: Proposed Site Plan Plan

Drawing scale: 1:100 @ A1

Drawing number: PL-040

Revision: P4

Project number: SJ 171001

Drawn by: CJB

Date: 02.09.2022

Approved by: JA

Drawing status: PLANNING

SILVER JETTY

Utility room / Plant / Storage

FFL :3.110

08 07 06 05 04 03 02 01 up

Utility room / Plant / Storage

FFL :3.110

08 07 06 05 04 03 02 01 up

Utility room / Plant / Storage

FFL :3.110

06 05 up 01 02 03 04

Proposed Lower Ground Floor Plan

Scale @ 1:50

Scale Bar

0 1m 2m 3m 5m

House 01 Lower Ground Floor GIA
Area: 55.73 m² - 599.8 sqft

House 02 Lower Ground Floor GIA
Area: 39.76 m² - 427.97 sqft

House 03 Lower Ground Floor GIA
Area: 44.8 m² - 482.2 sqft

General Notes

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Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS
P3	31.03.2023	PLANNING ISSUE	CJB

Client
SILVER JETTY LIMITED

Project title
The Boathouse

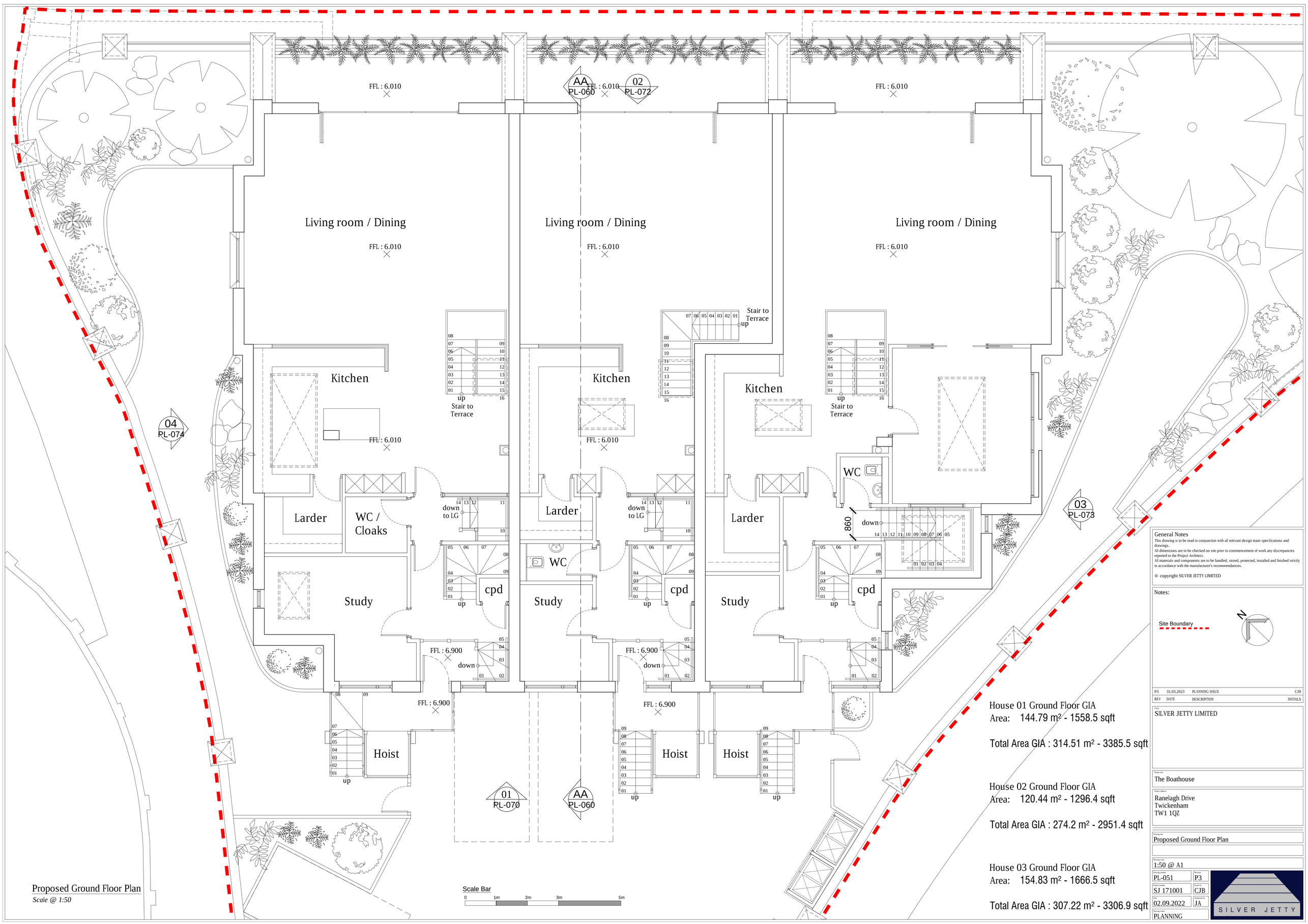
Project address
Ranelagh Drive
Twickenham
TW1 1QZ

Drawing title
Proposed Lower Ground Floor Plan

Drawing scale
1:50 @ A1

Drawing no. PL-050
Revision P3
Project number SJ 171001
Drawn by CJB
Date 02.09.2022
Authorised by JA
Drawing status PLANNING

SILVER JETTY



Proposed Ground Floor Plan

Scale @ 1:50

House 01 Ground Floor GIA
Area: 144.79 m² - 1558.5 sqft

Total Area GIA : 314.51 m² - 3385.5 sqft

House 02 Ground Floor GIA
Area: 120.44 m² - 1296.4 sqft

Total Area GIA : 274.2 m² - 2951.4 sqft

House 03 Ground Floor GIA
Area: 154.83 m² - 1666.5 sqft

Total Area GIA : 307.22 m² - 3306.9 sqft

General Notes

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All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS
P3	31.03.2023	PLANNING ISSUE	CJB

Client: SILVER JETTY LIMITED

Project title: The Boathouse

Project address: Ranelagh Drive, Twickenham, TW1 1QZ

Drawing title: Proposed Ground Floor Plan

Drawing scale: 1:50 @ A1

Drawing number	Revision
PL-051	P3
Project number	Drawn by
SJ 171001	CJB
Date	Authorised by
02.09.2022	JA

Drawing status: PLANNING

SILVER JETTY

AA PL-060

02 PL-072

Sedum roof

Sedum roof

Sedum roof

Glass Balustrade

Sky light to kitchen below

Sedum roof

House 01

House 02

House 03

Retractable skylight

Retractable skylight

Retractable skylight

Green Screen

Sky light to kitchen below

Green Screen

Sky light to kitchen below

All Terraces finished with man made timber decking and porcelain tiles

Sky light to snug below

Sedum roof

04 PL-074

Sedum roof

Sky light to Study below

Master Bedroom

Master Bedroom

Master Bedroom

cpd

cpd

cpd

01 02 03 04 05 06 up down 10 11 12 13 14 15 16

Dresser

Dresser

Dresser

En-Suite

En-Suite

En-Suite

En-Suite

Bedroom 02

Bedroom 02

Bedroom 02

cpd

cpd

cpd

Sky light to Stair Below

03 PL-073

01 PL-070

AA PL-060

Proposed First Floor Plan

Scale @ 1:50

Scale Bar

0 1m 2m 3m 5m

House 01 First Floor GIA
Area: 57 m² - 613.5 sqft

House 02 First Floor GIA
Area: 57 m² - 613.5 sqft

House 03 First Floor GIA
Area: 53.8 m² - 579.1 sqft

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS

Client: SILVER JETTY LIMITED

Project title: The Boathouse

Project address: Ranelagh Drive
Twickenham
TW1 1QZ

Drawing title: Proposed First Floor Plan

Drawing scale: 1:50 @ A1

Drawing number: PL-052	Revision: P3
Project number: SJ 171001	Drawn by: CJB
Date: 02.09.2022	Authorised by: JA
Drawing status: PLANNING	

SILVER JETTY

AA
PL-060

02
PL-072

04
PL-074

03
PL-073

01
PL-070

AA
PL-060

House 01

House 02

House 03

Bedroom 03

En-Suite

cpd

Bedroom 05

Bedroom 04

Bathroom

01 02 03 04 05 06 07 08 09 10 11 12 13

down

Proposed Second Floor Plan

Scale @ 1:50

Scale Bar

0 1m 2m 3m 5m

House 01 Second Floor GIA
Area: 57 m² - 613.5 sqft

House 02 Second Floor GIA
Area: 57 m² - 613.5 sqft

House 03 Second Floor GIA
Area: 53.8 m² - 579.1 sqft

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS
P3	31.03.2023	PLANNING ISSUE	CJB

Client: SILVER JETTY LIMITED

Project title: The Boathouse

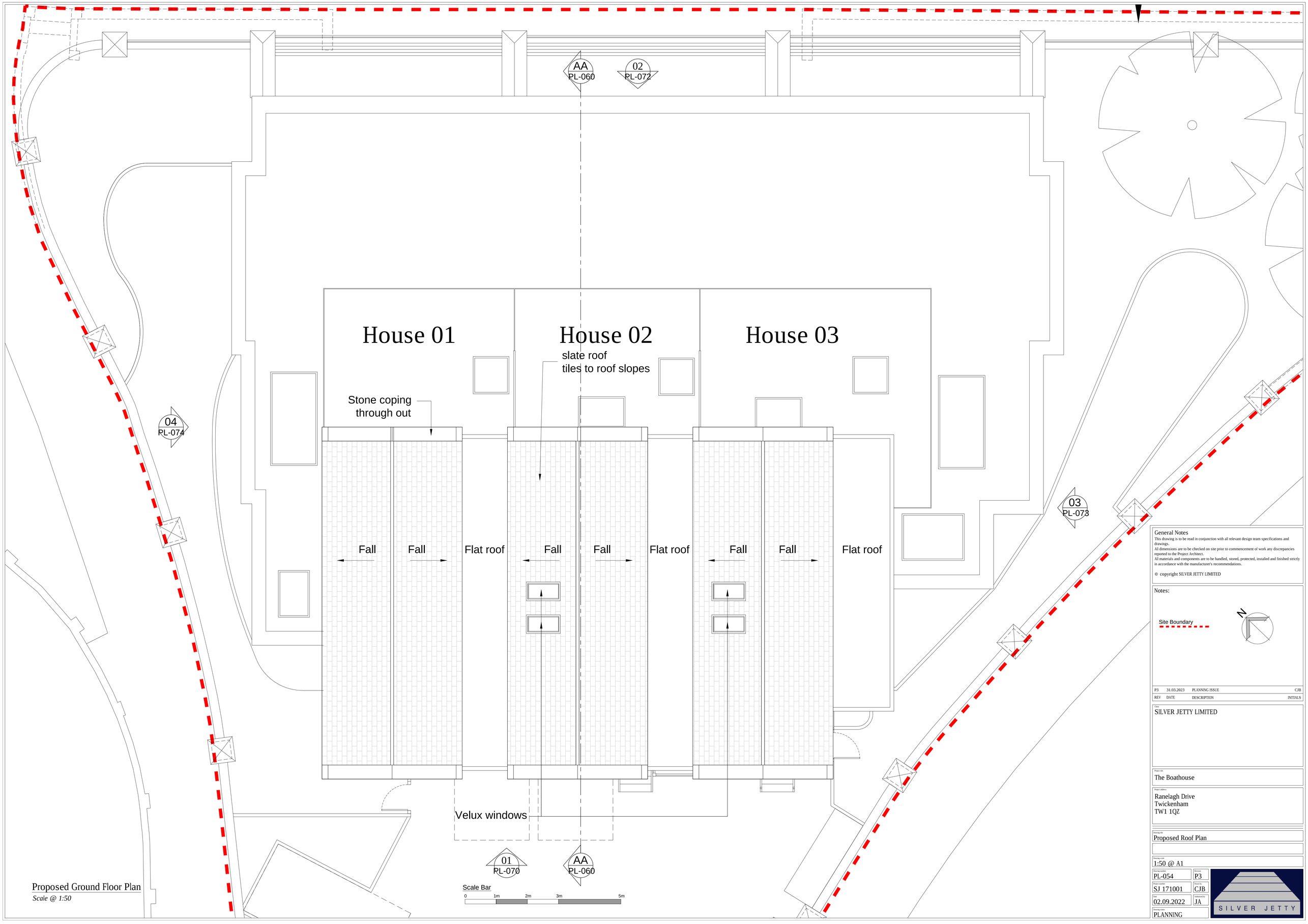
Project address: Ranelagh Drive
Twickenham
TW1 1QZ

Drawing title: Proposed Second Floor Plan

Drawing scale: 1:50 @ A1

Drawing number: PL-053	Revision: P3
Project number: SJ 171001	Drawn by: CJB
Date: 02.09.2022	Authorised by: JA
Drawing status: PLANNING	

SILVER JETTY



Proposed Ground Floor Plan

Scale @ 1:50

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

Site Boundary

N

REV	DATE	DESCRIPTION	INITIALS
P3	31.03.2023	PLANNING ISSUE	CJB

Client
SILVER JETTY LIMITED

Project title
The Boathouse

Project address
Ranelagh Drive
Twickenham
TW1 1QZ

Drawing title
Proposed Roof Plan

Drawing scale
1:50 @ A1

Drawing number
PL-054

Revision
P3

Project number
SJ 171001

Drawn by
CJB

Date
02.09.2022

Authorised by
JA

Drawing status
PLANNING

SILVER JETTY

Appendix 02: Response Letter to the EA Objections, Dated 01.02.2023, SLR Ref: 425.064470.00001

1 February 2023

Environment Agency
Sustainable Places Team

SLR Reference: 425.064470.00001

Dear Sir / Madam

RE: PRE-APPLICATION REQUEST - DEMOLITION OF EXISTING RESIDENTIAL BUILDING CONSISTING OF THREE RESIDNTIAL DWELLINGS AND DEMOLITION OF THE ANCILLARY OUTBUILDINGS TO PROVIDE THREE NEW RESIDENTIAL DWELLINGS INCLUDING ASSOCIATED LANDSCAPING WORKS, PROVISION OF PARKING AND WORKS TO THE PUBLIC REALM.

SITE LOCATION: THE BOATHOUSE, RANELAGH DRIVE, TWICKENHAM, TW1 1QZ

We write to request a pre-application meeting with the Environment Agency (EA) for the demolition of the existing residential building which consists of three residential dwellings to provide three new family sized residential dwellings at The Boathouse, Ranelagh Drive, Twickenham TW1 1QZ. The proposal would not only significantly improve the visual appearance of the site and the River Thames path, but would also address known deficiencies with the existing flood defences. This will ensure that the proposed building on site would have an appropriate standard of protection that both meets current requirements and potential changes in flood severity over the project development lifetime.

As part of the pre-application request we seek to have a meeting with EA officer's as well as written feedback.

Further details of the proposal and the background of the site have been provided.

The proposal

The proposal is for the replacement of three existing residential dwellings to provide three family sized residential dwellings in a new building. In addition, the proposal includes improvement to the public realm through increasing the width of the public footpath, facing the River Thames and providing a new seating area for the public, new parking arrangement and a new landscaping scheme.

As part of the pre-application request, we submit the following information, alongside this letter:

- The pre-application response from the EA, ref. SL/2021/12091/01-L01, dated April 2021;
- The now withdrawn Flood Risk Assessment and Surface Water Drainage Strategy (dated September 2022), prepared by SLR Consulting;
- Site Location Plan (drawing ref. PL-001 rev. P2);
- Existing Site Plan (drawing ref. PL-002 rev. P2);
- Existing and proposed Footprints (drawing ref. PL-005 rev. P2);
- Existing Ground Floor Plan (drawing ref. PL-010 rev. P2);
- Existing First Floor Plan (drawing ref. PL-011 rev. P2);
- Existing Sections AA and BB (drawing ref. PL-020 rev. P2);
- Existing South and West Elevations 01-02 (drawing ref. PL-030 rev. P2);
- Existing North and East Elevations 03-04 (drawing ref. PL-031 rev. P2);
- Proposed Site Plan (drawing ref. PL-040 rev. P2);
- Proposed Landscaping Plan (drawing ref. PL-041 rev. P2);
- Proposed Lower Ground Floor Plan (drawing ref. PL-050 rev. P2);
- Proposed Ground Floor Plan (drawing ref. PL-0051 rev. P2);
- Proposed First floor Plan (drawing ref. PL-052 rev. P2);
- Proposed Second Floor Plan (drawing ref. PL-053 rev. P2);
- Proposed Roof Plan (drawing ref. PL-054 rev. P2);
- Proposed Section AA (drawing ref. PL-060 rev. P2);
- Proposed South Elevation (drawing ref. PL-070 rev. P2);
- Proposed North Elevation (drawing ref. PL-072 rev. P2);
- Proposed East Elevation (drawing ref. PL-073 rev. P2); and
- Proposed West Elevation (drawing ref. PL-074 rev. P2).

The submitted drawings have been amended following on from the withdrawal of the planning application (LPA ref. 22/3017/FUL). Further details have this have been set out in the Background section.

Further details of the background to the site and the flooding matters have been set out below.

Background

This scheme has already had pre-application discussions with both the London Borough of Richmond upon Thames (LBRuT) (LPA ref. 20/P0166/PREAPP, in August 2020) and the EA (EA ref: SL/2021/120910/01-L01, dated April 2021) where the proposal was for a development involving nine dwellings. Both the EA and LBRuT were supportive of the principle of the residential use on the site and the reducing of flood risk through the redevelopment of the site, however, the increase in the number of dwellings proposed was not supported. The EA stated that they would only support the same number of dwellings that are on the site in any new application.

The proposals for the site had therefore, evolved to address the comments received and a new application was submitted (LPA ref. 22/3017/FUL). This proposal was for three residential dwellings

as well as increasing the ground floor elevation of the building by 1.6m (as recommended by the EA during the pre-application discussions).

The EA objected via a letter dated 5 December 2022 (EA ref. SL/2022/122337/01-L01) to this planning application on two grounds:

1. Proposed development incompatible with flood zone; and

2. Inadequate Flood Risk Assessment.

Historic England also raised concerns regarding the massing, height and design of the proposed building. The application was subsequently withdrawn to allow time to address these comments.

The proposal has been amended to address comments received. These amendments include the following:

- Reduction of the width of southern elevation of the proposed building by 5.4m;
- Reduction of the width of the northern elevation of the proposed building by 5.4m; and
- The scheme ensures that there are no windows whatsoever below the EA threshold datum.

We are keen to get a view on the proposal from the EA ahead of resubmission through a pre-application meeting. However, this letter has been drafted to address the EA's objection during the now withdrawn planning application.

Details of our response have been set out below.

Response to the EA objection

This current letter is written is response to the consultation response from the EA during the now withdrawn planning application, summarised above.

In the following sections this letter responds to each of the reasons for objection given by the EA. For clarity relevant text from the Environment Agency consultation letter is reproduced below in red with SLR's response provided in black.

<u>Proposed development incompatible with flood zone</u>

> We object in principle to the proposed development as it falls within a flood risk vulnerability category that is inappropriate to the Flood Zone in which the application site is located. The application is therefore contrary to the National Planning Policy Framework and its associated planning practice guidance. We recommend that planning permission is refused on this basis.
>
> The PPG classifies development types according to their vulnerability to flood risk and provides guidance on which developments are appropriate within each Flood Zone. This site lies within Flood Zone 3b, functional floodplain, which is land defined by the PPG and

your Strategic Flood Risk Assessment as having a high probability of flooding. This is because the development is proposed riverwards of the flood defence line.

The Flood Risk Assessment submitted with the application confirms that the site is located within Flood Zone 3a and not Flood Zone 3b, as suggested by the EA.

The understanding that the site is located within Flood Zone 3a is based on the LBRuT's Strategic Flood Risk Assessment undertaken by Metis Consultants (2021). Mapping from this report, which is included below, shows that the site is located wholly within Flood Zone 3a.

Figure 1
London Borough of Richmond upon Thames SFRA Flood Zone Designation Mapping

We would note that the Planning Practice Guidance (PPG) for Flood Risk and Coastal Change confirms that it is the responsibility of the local planning authority (i.e. LBRuT) to define the extent of Flood Zone 3b.

The LBRuT SFRA is recent, it references the most recent available flood model outputs and was published following due consultation with the EA. This is therefore clearly the correct and most appropriate point of reference for defining Flood Zone 3b in the borough. As noted above this source places the site in Flood Zone 3a.

With reference to Table 3 of the PPG regarding flood risk compatibility, residential development (a more vulnerable development type) in Flood Zone 3a is permitted subject to the scheme passing the Exception Test.

> We note that a Certificate of Lawfulness (ref: 19/0141/ES191) was granted for use of part of the existing property (excluding Unit 1) as 2 no. flats in multiple occupation for up to 6 people.
>
> Richmond Local Plan Policy LP 21 Flood Risk and Sustainable Drainage states that in Flood Zone 3b 'redevelopment of existing developed sites will only be supported if there is no intensification of the land use and a net flood risk reduction is proposed; any restoration of the functional floodplain will be supported. Proposals for the change of use or conversion to a use with a higher vulnerability classification will not be permitted.'.
>
> The increase in the number of units and the introduction of basements to the properties, even though the basements do not include habitable rooms, would be classified as an intensification of the land use and an increase in the flood risk vulnerability. This is therefore against the Richmond Local Plan Policy LP 21.

We would firstly note that the EA's comments above should be reviewed and amended with the understanding that the site is located in Flood Zone 3a and not Flood Zone 3b.

In addition, the EA have also concluded that there are only two residential dwellings and they have come to this assumption based on a certificate of lawfulness that was issued in June 2019 (LPA ref. 19/0141/ES191) for two units on the site. The EA have misinterpreted the background of this certificate. The existing building consists of three residential dwellings which are all in occupation by residential tenants under three separate short tenancy agreements. Further details of the history of the site have been set out below.

A Certificate of Lawful Development for Existing Use of the premises as three separate residential dwellings was refused in May 2017 as the evidence presented to LBRuT, at the time, did not demonstrate that on balance of probability, the use of the premises was in three separate residential dwellings. However, this lack of evidence only related to Unit 1 (Unit 2 and Unit 3 were not of a concern).

Subsequently, a new application was submitted for Unit 2 and 3 (only) for a Certificate of Lawful Existing Use, under LPA ref. 19/0141/ES191. It was determined that Unit 2 and 3 were in residential use under either C3. The officer's report (attached in Appendix 01) stated, "on the balance of the probability, and given the fact that the Council do not have substantial evidence to suggest otherwise, the Council are satisfied that Units 2 and 3 have been continuously used as separate self-contained residential units for over 4 years".

In terms of Unit 1, the officer's report goes onto say that an enforcement case had been opened for the "unauthorised change of use of the property into one studio flat (unit 1)". The officer's report confirms that the investigation was subsequently closed as the LBRuT Enforcement Officer conceded that "on the balance of probability, they were satisfied that the change of use had occurred 4 years before the date of their assessment (11/06/2014)". Unit 1 continues to be

in residential (C3) use. All quotes taken from the officer's report have been highlighted within the document in yellow for ease.

In short, given the current tenancy circumstances, all three residential dwellings are currently in use as C3 residential dwellings.

The proposal is seeking to replace the existing three residential dwellings with three residential dwellings, i.e. like-for-like and therefore, no intensification of the site is proposed in terms of the number dwellings on the site.

Given that the site is not in Flood Zone 3b and there is no increase in the number of units proposed on the site, the proposed scheme is clearly not contrary to Richmond Local Plan Policy LP 21.

Inadequate Flood Risk Assessment

> The lower level of the proposed development will form the flood defence, but the drawings do not clearly delineate this flood defence line. The applicant should submit plan and section drawings that clearly show the flood defence line, and provide design information that details how they will ensure this part of the building remains impermeable to flood waters.

There are two existing flood defences in the area of the site, as delineated by the Environment Agency, on the flood map for planning. The main strategic flood defence line is set back from the site and will not be impacted by the proposed development in any way.

The other defence shown circles the existing building on the site and consists of the property wall. As discussed within the FRA regular flooding of the existing property (which has a finished floor level for habitable areas of 4.6m aOD) is prevented by the raised threshold which is set at 5.85m aOD.

For the avoidance of doubt, no other land or properties rely on this site flood defence.

It is proposed that through the redevelopment of the site

- The existing building, including the boundary wall that is the designated flood defence, is demolished
- A new raised and engineered threshold to a height of 6.9m aOD is created at the boundary to the new properties; and
- The minimum finished floor level for habitable areas of the properties is raised to 6.01m aOD.

As the existing building wall is a designated flood defence, these works will need to be subject to flood risk activity permit which is distinct and in addition to planning approval. This more detailed submission would be undertaken post planning and will provide an ongoing opportunity for the Environment Agency to guide and influence these works.

At this stage plans are provided in Appendix 02 showing both the current designated flood defence alignment and the and the new raised engineered threshold to the proposed development.

Finished floor levels

The existing building finished floor levels are between around 5.65 and 5.85mAOD (FRA page 5). The applicant currently proposes a ground floor finished floor level of 6.01mAOD with access to the property raised to 6.9mAOD via steps (FRA page 25).

All finished floor levels should be raised to at least 6.6mAOD, 300mm above the design flood level. This is mandated by Paragraph 6.2.6 in the supporting text for Policy LP 21 of the Richmond Local Plan. The applicant should aim to meet this requirement in the first instance.

If raising the finished floor levels 300mm above the design flood level is unachievable, then the applicant must submit evidence to justify why. If the Environment Agency and Local Planning Authority are satisfied with this evidence, then we may consider other measures to prevent water ingress, such as the proposed method utilising raised access thresholds. This would need to be accompanied with details of other flood resistance measures to ensure the dwelling is adequately flood proof. Finished floor levels should be raised as high as possible when also incorporating other flood resistance measures.

The proposed ground floor finished floor level of 6.01m aOD is 1.41m higher than the lowest current habitable floor level on the site which is at 4.6m aOD (nb. 5.65 to 5.85m aOD is the threshold which would currently need to be exceed for flooding to occur). As such, irrespective of any other measures, this will reduce the probability of internal flooding.

Whilst the finished ground floor level is set at 6.01m aOD, the proposed engineered threshold level is 890mm above this at 6.9m aOD. This will ensure the internal areas of the building remain flood free to this level, which is 600mm beyond the design tidal flood level locally.

Raising the finished floor levels beyond 6.01m aOD is not achievable at the site because there are Metropolitan Open Land (MOL) and heritage considerations on how high the roofline of the property can extend. It is also not possible to reduce the floor to ceiling clearance height and comply with building regulations. We would further note that the principle employed in the proposed scheme was agreed with the Environment Agency at the pre-application stage.

Vents/windows

Section 5.5 Finished floor levels of the FRA (page 25) states that 'any vented areas [will be] fitted with valves to inhibit flood water ingress'. We see that the SuDS system will include a non-return valve, but it is unclear if the applicant also plans to install these into the proposed dwellings too. Please clarify where the aforementioned valves will be installed and what they will be used for. We note that we would not accept non-return valves as a form of flood resistance as we do not consider them to be a permanent fixed barrier to prevent water ingress.

Page 55 of the FRA (drawing titled 'Proposed Section AA' by Silver Jetty Limited; drawing number PL-060, project number SJ171001, dated 22.11.2021) includes a 'high level window to Lower Ground Floor'. This is located below 6.6mAOD, the 300mm freeboard above the design flood level, and could therefore allow water ingress into the new

dwellings. Therefore, the development would not be kept safe for its lifetime from flooding, as required by Paragraph 159 of the NPPF.

All vents, apertures, windows and similar potential water ingress points should be located 300mm above the design floor level as a minimum to prevent water ingress. The applicant should revise their plans to ensure that there are no water entry points below the design flood level plus freeboard.

We can confirm that all apertures to properties will be raised to at or above 6.9m aOD (i.e. 300mm above the design flood level). This includes all doors, window and ventilation for the building.

We acknowledge that drawing number PL-060, project number SJ171001, dated 22.11.2021, which was included in the FRA, does show a low-level window. This version of the drawing was included in the report in error. The correct version of this drawing is dated 30.08.2022 (included within the application and now included in Appendix 03). In that updated version the low-level window is removed.

Gravity foul drainage connections will be provided below this elevation; however, these will be fitted with non-return valves so that the foul drainage network could not be a route for the ingress of flood water into the properties. These non-return valves will be provided both at the outlet from the individual units into the foul drain and also at the site level within a manhole on the site. A plan showing the indicative location of these valves is appended (Appendix 04); however, their final location and specification will be confirmed post planning as part of the Building Regs stage design.

These valves will be inspected (and if required repaired / replaced) annually as part of a wider site and property management plan. Given the dual protection proposed (i.e. 2 valves need to fail before flooding is possible) and a robust programme of monitoring and maintenance, the probability of flood water ingress via the foul drainage network is negligible.

As noted by the EA, the SuDS system will also include a non-return valve to prevent tidal water backing up into the site drainage network through the local sewerage network. The storm water system will however all be exterior to the 6.9m aOD raised threshold and so this valve will have no function in protecting the internal areas of the proposed properties. Instead, the valve on the SuDS system is intended to ensure that sufficient space exists within the site storm water drainage network to receive and accommodate runoff without surcharge during periods of tide lock when the sewer cannot freely discharge to the Thames.

Assess flood storage

> Section 5.6 Flood compensation of the FRA (page 25) correctly identifies that any loss of flood storage must be offset by providing compensation. However, it fails to provide an assessment of whether there is a loss of flood storage on site as a result of the development.
>
> The applicant must submit flood storage calculations on a level-for-level and volume-for-volume basis to demonstrate whether there is a loss of flood storage on site and, where necessary, identify any compensatory flood storage provided.
>
> We would like to reiterate that Richmond Local Plan Policy LP 21 states 'Redevelopment of existing developed sites will only be supported if there is no intensification of the land use and a net flood risk reduction is proposed; any restoration of the functional floodplain will be supported.'. We therefore encourage the applicant to maximise the amount of storage available on site.

Compensatory flood storage must be provided for any developments in the fluvial floodplain which reduce the available flood storage on a site. The effect of a loss of flood storage within the undefended tidal floodplain is however negligible.

Whilst the design flood level adopted at the site is 6.3m aOD, we would emphasise that this is a tidal flood level. The site is also located within the fluvial floodplain; however, the maximum expected fluvial flood height, taken from the Lower Thames, Jubilee River and River Ash hydraulic model provided by the Environment Agency, is significantly lower at 5.42m aOD.

It is therefore only necessary to demonstrate that level-for level storage is conserved up to the maximum fluvial flood level of 5.42m aOD.

Models of the current and proposed site levels have been developed and are included in Appendix 05. These have been used to assess how the scheme will impact flood storage. Based on this, a level for level comparison of available flood storage on the site is provide in Table 1 below. This shows that following development flood storage volumes will be maintained and increased at all elevation up to the design fluvial flood height of 5.42m aOD.

Table 01:
Level for Level Storage Comparison

Elevation band	flood storage (m^3)		
	current	proposed	change
5.32m aOD - 5.42m aOD	58.00	62.34	4.34
5.22m aOD - 5.32m aOD	33.09	62.34	29.25
5.12m aOD - 5.22m aOD	11.89	58.03	46.14
5.02m aOD - 5.12m aOD	6.36	28.78	22.42
4.92m aOD - 5.02m aOD	4.50	18.25	13.75
4.82m aOD - 4.92m aOD	3.20	13.85	10.65
4.72m aOD - 4.82m aOD	2.18	8.38	6.20
4.62m aOD - 4.72m aOD	1.37	6.81	5.44
4.52m aOD - 4.62m aOD	0.72	6.04	5.32
4.42m aOD - 4.52m aOD	0.14	5.05	4.91
4.32m aOD - 4.42m aOD	0.02	4.16	4.14
4.22m aOD - 4.32m aOD	0.00	1.92	1.92

This is achieved because:

- the building footprint (which is currently sealed to flood ingress to a height of 5.65 to 5.85m aOD) will not be significantly changed as a result of the development (see Appendix 01);
- the external ground levels to the rear (away from river) of the property will be lowered from the existing by the development; and
- the site boundary wall will be moved away from the river and the additional land between the new wall and the river will be lowered to the level of the riverside walk.

Conclusions

Based on the above, we consider that we can address the EA's objections in relation to LPA ref. 22/3017/FUL. We would appreciate a pre-application meeting with you to discuss our response to your original objection.

We trust that the additional information and clarification contained within this letter is helpful and look forward to having a meeting with you to discuss in more detail.

Yours sincerely
SLR Consulting Limited

Daniel Watson
Technical Director

Cc Julian Amos (Silver Jetty), Philip Villars (PMV Planning), Joe Martyn (Environment Agency)

Enc: Appendix 01: LPA ref. 19/0141/ES191 CLEUD Officers report
Appendix 02: Plans showing the existing building against proposed building footprint
Appendix 03: Proposed Section AA, Drawing number PL-060, project number SJ171001, dated 30.08.2022
Appendix 04: Indicative location of non-return valves
Appendix 05: Current and proposed ground models

APPENDIX 01:

LPA REF. 19/0141/ES191 CLEUD OFFICERS REPORT

LONDON BOROUGH OF RICHMOND UPON THAMES
ENVIRONMENT DIRECTORATE

PLANNING REPORT

Printed for officer by
Mr Akshay Sisodia on 21 June 2019

Application reference: 19/0141/ES191

ST MARGARETS, NORTH TWICKENHAM WARD

Date application received	Date made valid	Target report date	8 Week date
16.01.2019	16.01.2019	~~13.03.2019~~ 26/06/2019	~~13.03.2019~~ 26/06/2019

Site:
The Boathouse, Ranelagh Drive, Twickenham, TW1 1QZ

Proposal:
Continued use of part of the property (excluding a Unit 1) as two separate flats in use for multiple occupation, where occupation has fluctuated up to a maximum of 6 people and no less than one person for a period over four years. (As amended in CAPS)

Status: Pending Decision (If status = HOLD please check that all is OK before you proceed any further with this application)

APPLICANT NAME
Mr Peter Gbedemah
64 Cavendish Street
London
W1G 8TB

AGENT NAME
Mrs Alex Ground
2 Putney Road
London
SW15 6AB

DC Site Notice: printed on and posted on and due to expire on

Consultations:
Internal/External:

Consultee	Expiry Date

Neighbours:

22 Martineau Drive,Twickenham,TW1 1PZ -

History: Development Management, Appeals, Building Control, Enforcements:

Development Management Status: WNA Date:09/11/2012	Application:09/2376/COU Proposed Change Of Use From A Redundant Private Music Recording Studio Into A Single Private Residence.
Development Management Status: WNA Date:09/11/2012	Application:09/2459/FUL Retention of existing use of lower ground floor as a private recording studio and extension residential use onto part of the existing upper ground floor terrace and into the roof.
Development Management Status: REF Date:15/05/2017	Application:17/0668/ES191 Use of the premises as 3 separate residential units with ancillary car parking (unit 1 used as Use Class C3, Units 2 and 3 used as Use Class C4).
Development Management Status: PDE Date:	Application:19/0141/ES191 Continued use of part of the property (excluding a Unit 1) as two separate flats in use for multiple occupation, where occupation has fluctuated up to a maximum of 6 people and no less than one person for a period over four years.

Enforcement
Opened Date: 14.11.2013 Enforcement Enquiry
Reference: 13/0584/EN/UCU

Enforcement
Opened Date: 03.07.2018 Enforcement Enquiry
Reference: 18/0327/EN/UBW

Recommendation:
The determination of this application falls within the scope of Officer delegated powers - YES / NO

I therefore recommend the following:

1. REFUSAL ☐
2. PERMISSION ☑
3. FORWARD TO COMMITTEE ☐

This application is CIL liable ☐ YES* ☑ NO
(*If yes, complete CIL tab in Uniform)

This application requires a Legal Agreement ☐ YES* ☑ NO
(*If yes, complete Development Condition Monitoring in Uniform)

This application has representations online (which are not on the file) ☑ YES ☐ NO

This application has representations on file ☐ YES ☑ NO

Case Officer (Initials): AKS Dated: 08/03/2019

I agree the recommendation:

Team Leader/~~Head of Development Management/Principal Planner~~

Dated: 21/6/19

This application has been subject to representations that are contrary to the officer recommendation. The Head of Development Management has considered those representations and concluded that the application can be determined without reference to the Planning Committee in conjunction with existing delegated authority.

Head of Development Management: .....

Dated: .....

REASONS:
CONDITIONS:
INFORMATIVES:
UDP POLICIES:
OTHER POLICIES:

The following table will populate as a quick check by running the template once items have been entered into Uniform

SUMMARY OF CONDITIONS AND INFORMATIVES

CONDITIONS

INFORMATIVES

19/0141/ES191
The Boathouse, Ranelagh Drive, Twickenham, TW1 1QZ

Site Description

The application site comprises a two-storey detached building sited to the north of Ranelegh drive sited on the south west bank of the River Thames. The building is a former boat building workshop/house and has been used as a recording studio.

The building is not statutorily or locally listed but is sited within the St Margarets Conservation Area. The site is also sited within Metropolitan Open Land, a protected view corridor, and is within the functional floodplain being in Flood Zone 3b.

Planning History:

The most recent planning history is included below:

- 17/0668/ES191 – Use of the premises as 3 separate residential units with ancillary car parking (unit 1 used as Use Class C3, Units 2 and 3 used as Use Class C4) – Application Refused 15/05/2017 – Refusal Reason: *'The available evidence is considered insufficient to demonstrate that 'on the balance of probability' the use of the premises (The Boathouse Ranelagh Drive Twickenham) as three separate residential units (Unit 1- within Use Class C3 use; and Unit 2 & 3-within Use Class C4 use) has subsisted for a continuous period of 4 years and consequently it cannot be demonstrated that the use is lawful within the meaning of section 191 of the Town and Country Planning Act 1990.'*

- 09/2459/FUL - Retention of existing use of lower ground floor as a private recording studio and extension residential use onto part of the existing upper ground floor terrace and into the roof - Decided as no further action be taken 09/11/2012

- 09/2376/COU - Proposed Change Of Use From A Redundant Private Music Recording Studio Into A Single Private Residence - Decided as no further action be taken 09/11/2012

The property was constructed in the 1960s when in September 1966 planning permission was granted to erect a two storey building comprising boat building workshop and residential accommodation (LB Hounslow ref: 923/A/P1). Permission was later granted for the workshop to be used for the demonstration and production of films (LB Hounslow ref: 923/A/P3) and as a commercial recording studio (LB Hounslow ref: 923/A/P8)

Planning Enforcement History

- 13/0584/EN/UCU – Unauthorised Change of Use – Property is let as 2 flats – Case Closed 30/06/2014

- 18/0327/EN/UBW – Unauthorised building works – Three separate units of accommodation are being tenanted – Under Investigation

Amendments:

- The application's description of development has been altered to more accurately reflect the development, additional detail has been provided in the new description of development.

Applications for a Lawful Development Certificate are not subject to neighbour consultation, consequently no neighbour consultation was initiated following this description change.

Proposal:

The application seeks a Certificate of Lawfulness of Existing Use or Development (CLEUD) to establish the continued use of part of the property as two separate self-contained flats for a period of over 4 years. The units that the application relates to includes:

- 'Unit 2' – Four bedroom ground floor flat with its entrance on the south west side of the property and falling within Use Class C4.
- 'Unit 3' – Five bedroom first floor flat with its entrance on the south west side of the property and falling within Use Class C4.

* Use Class C4 refers to small shared houses occupied by between three and six unrelated individuals, as their only or main residence, who share basic amenities such as a kitchen or bathroom. The applicant's submitted evidence indicates that units 2 and 3 have been used as two separate flats in use for multiple occupation, where occupation has fluctuated up to a maximum of 6 people and no less than one occupant, but the characteristics of separate dwellings have been retained throughout the existence of the units. This Certificate of Lawfulness of Existing Use or Development (CLEUD) application has essentially been submitted to in attempt to verify that the units have been in use as above for a period of over 4 years.

Representations

Whilst public consultation was not undertaken on the application, it was subject to No.1 third-party objection. This objection can be summarised as:

- The property owners have failed to maintain the premises and have allowed the grounds and garages to be overgrown, resulting in problems to adjoining Council footpath and potentially neighbouring properties. This should be looked into prior to approving the application.

Professional Comments:

Legislation & Case Law

Section 171B(2) of the Town and Country Planning Act 1990 (as amended) states that '*where there has been a breach of planning control consisting of a change of use of any building to a use as a single dwellinghouse, no enforcement action may be taken after the end of the period of four years beginning with the date of the breach*'.

"Taking enforcement action" is defined in section 171A of the 1990 Act. It is the issue of an enforcement notice or the service of a breach of condition notice. The section also defines a "breach of planning control" (against which it is possible to take enforcement action) as the carrying out of development without the required planning permission, or failing to comply with any condition or limitation subject to which planning permission has been granted.

The Planning Practice Guidance (PPG) outlines how Section 191 applications should be assessed by Local Planning Authorities, and specifies that the "*The applicant is responsible for providing sufficient information to support an application, although a local planning authority always needs to co-operate with an applicant who is seeking information that the authority may hold about the planning status of the land...*" (Paragraph: 006; Reference ID: 17c-006-20140306; Revision date: 06 03 2014)

The Courts have held that the relevant test of the evidence on such matters is 'the balance of probability'. The PPG also states that "*...if a local planning authority has no evidence itself, nor any from others, to contradict or otherwise make the applicant's version of events less than probable, there is no good reason to refuse the application, provided the applicant's evidence alone is sufficiently precise and unambiguous to justify the grant of a certificate on the balance of probability.*"

As noted within the applicants 'Grounds for Application...' document, the term 'dwellinghouse' is not defined within the Town and Country Planning Act 1990, though case law has established that '*the distinctive characteristics of a dwellinghouse is its ability to afford those who use it the facilities required for day to day private domestic existence*' [Gravesham BC v The SoS for the Environment and Michael W O'Brien [1982]].

The applicants 'Grounds for Application' notes further case law which identifies that, as long as the facilities for day-to-day domestic existence are provided a building or flat in use as a House of Multiple Occupation (HMO) can constitute a dwellinghouse [paragraph 20 of appeal decision notice ref: APP/G5750/X/14/2216166: Michael Wordsworth Aimey v Newham LLB (2015) at 390/390b Sherrard Road Manor Park E12 6UQ].

Case law in the form of *Secretary of State for the Environment v Holding and Thurrock Borough Council [2002]* identifies that, to become lawful, a use must have continued actively throughout the four year period, to the extent that enforcement action could have been taken against it at any time during that period.

Only once lawful use 'rights' have been accrued in this way can the principle described in the *Panton and Farmer v Secretary of State for the Environment* (1999) judgement apply, where the use can become "dormant" without losing its use 'rights', unless it is abandoned, replaced by a different use, or extinguished following the formation of a new planning unit. Any significant interruption in the continuity of an unauthorised use, before it has gained rights under the four year rule (for use a single dwellinghouse), means that the particular breach is at an end, and, when the use recommences, the four year period must start again.

Submitted Evidence

The application is made on the basis that the premises, as indicated on the submitted 'Ground Floor' and 'First Floor' property plans, have been continuously used as two separate residential units, which each constitute a single dwellinghouse, for more than four years

The applicant has submitted a number of supporting documents in relation to the continuous use of the part of the building as two separate residential units. Key documents include:

Statutory Declarations:

1) A Statutory Declaration of Peter Gbedemah, confirming that he was the director of a company (Boathouse Twickenham Ltd), which purchased the building (including Unit 1 which is not subject to this pre-application) from a company titled Venture (One) Limited on 25/05/2016. The sale was registered with the Land Registry, and the title deeds (Exhibit PG 01) and property layout plan (Exhibit PG 02) are append to the Statutory Declaration. Mr Gbedemah's Statutory Declaration indicates that he visited the property 'just before' its acquisition, and confirms that the layout was as three separate units as shown on the property layout plan (Exhibit PG 02).

Within the Statutory Declaration, it is indicated that to the best of Mr Gbedemah's knowledge, the units subject to this Certificate of Lawful Development application have been in continuous use as separate residential dwellings in excess of 4 years, Mr Gbedemah indicates that he has spoken with two longstanding tenants of Units 2 and 3 Pawel Grejner and Neringa Figuriniate who confirm that this is the case. It is indicated that the number of tenants occupying Units 2 and 3 has varied throughout the time that the since the time that the company purchased the property, but confirms that Units 2 and 3 have always been occupied by at least one resident, but no more than 6.

Within the Statutory Declaration it is indicated that when the building was acquired by Boathouse Twickenham Ltd, they regularised the Council Tax position to reflect the actual use of the premises as separate residential units. Evidence of an application made to the Council for the amendments to the Council Tax rates of units, and notices from the Valuation Office confirming the same are appended to the Statutory Declaration (Exhibit PG 03).

2) A Statutory Declaration of Naringa Figuriniate, confirming that they were employed by a previous owner of the property, Venture (One) Limited, as the property manager from 14/09/2014, at which time they would visit the property regularly, with their role being to find tenants for the property, checking the state of the premises and reporting any works that require maintenance. When first employed in their role, it is confirmed that the property consisted of one studio flat (shown as unit 1 of the appended Plan - Exhibit NF01) and one self-contained maisonette with a ground floor and first floor level.

   When starting their role, it is confirmed that the self-contained maisonette had only a shower room downstairs, in June 2013 the freeholder for the property installed a new additional bathroom downstairs. In October 2014, it is confirmed that the freeholder for the property separated the self-contained maisonette into two separate flats, one on the ground floor (Unit 2) and one on the first floor (Unit 3). This was achieved through the installation of a locked door between the ground and first floors, with units 2 and 3 having entirely separate access. It is indicated that both Units 2 and 3 have all the facilities for day-to-day living, including a separate kitchen and bathroom.

   It is confirmed that the appended property plan drawing (Exhibit NF 01) is an accurate representation of the site following the separation of the self-contained maisonette into two separate flats in October 2014. Naringa Figuriniate provides confirmation that Units 2 and 3 of the property as two separate dwellings from October 2014 to the present date, it is indicated that they have lived in the property since October 2015, residing in Unit 3 from October 2015 to May 2016 and Unit 2 from May 2016 to the present day. It is confirmed that that throughout their occupation of the property they have observed that all of the units have been used as solely residential accommodation and at all times the units were occupied by at least one person and no more than six people.

3) A Statutory Declaration of Pawel Grejner, confirming that they have lived within Unit 2 since May 2014, and currently still reside there. It is indicated that when they first occupied Unit 2, and until October 2014, they had access to the first floor as well via the internal staircase, but only ever utilised the facilities on the ground floor.

   It is indicated that when they first moved into the property, it consisted of one studio flat (shown as unit 1 of the appended Plan - Exhibit PG 01) and one self-contained maisonette with a ground floor and first floor level. In October 2014, it is confirmed that the freeholder for the property separated the self-contained maisonette into two separate flats, one on the

ground floor (Unit 2) and one on the first floor (Unit 3). This was achieved through the installation of a locked door between the ground and first floors, with units 2 and 3 having entirely separate access. It is indicated that both Units 2 and 3 have all the facilities for day-to-day living, including a separate kitchen and bathroom. It is confirmed that the appended property plan drawing (Exhibit PG 01) is an accurate representation of the site following the separation of the self-contained maisonette into two separate flats in October 2014.

It is confirmed that other residents have lived in Unit 2 since they have been occupying the property, however the unit has always been occupied by at least one person, and never more than six. Furthermore, they have observed that Unit 3 has always been occupied by at least one person and never more than six people.

Other Supporting Information:

Grounds for an Application for a Lawful Development Certificate – The document is a statement which provides an introduction to the site, its planning history and background, an examination of legislation and case law relating to the application, and an examination of evidence to demonstrate the lawful use of the units. The following documents are appended to the applicant's Grounds for an Application for a Lawful Development Certificate document:

- Appendix 1 – Existing Floor plan drawings
- Appendix 2 – Evidence provided by former Owner (David Wainwright) to demonstrate that the site has been in continuous use as separate self-contained dwellinghouses for over 4 years in response to Planning Contravention Notice served on 11/02/2014.
- Appendix 3 – Email correspondence with Planning Enforcement Officer.
- Appendix 4 – Appeal decision for development proposed to '1 Crownfield Road, Ashford, TN23 SED (APP/E2205/X/14/2226496) – Establishes that 4 years is the period required of continuous use for a C4 use class unit to gain immunity from enforcement action.
- Appendix 5 – Appeal decision for development proposed to '9 Stonebridge Park, London, NW10 8EJ' (APP/T5150/X/15/3138588) – Establishes that it is immaterial that units may have been used as C3 at certain times and C4 at other times provided that that the use within either of the same use classes has continuously existing for a period of over 4 years.
- Appendix 6 – Appeal decision for development proposed to 'Land at 67A Hounslow Road, Twickenham, TW2 7HA' (APP/L5810/C/17/3172432) – Establishes that it is appropriate to attach substantial weight to Statutory Declarations.

Assessment:

The onus is on the applicant to demonstrate that, on the balance of probability, the units have been used as a self-contained flats for a continuous period of 4 years. The Council does not provide evidence to contradict the evidence provided by the applicant. Rather, the LPA considers whether the evidence provided is sufficient to demonstrate the continuous use of the unit.

The LPA takes the view that most reliable evidence provided by the applicant in support of the application is the Statutory Declarations from Peter Gbedemah, Naringa Figuriniate, and Pawel Grejner. Given that the fabrication of a false Statutory Declaration is a criminal offence and could

result in the payment of significant fines and/or imprisonment, the council will give significant weight to these documents. Furthermore, as referenced in the applicant's Grounds for an Application for a Lawful Development Certificate, in a recent appeal decision regarding the retention/continued use of an unlawfully subdivided first floor flat within the borough (Land at 67A Hounslow Road, Twickenham, TW2 7HA - APP/L5810/C/17/3172432), the inspector established that it is appropriate to attach "substantial" weight to Statutory Declarations where the information contained within them is "precise and unambiguous and where they have been properly declared and witnessed".

The Evidence of an application made to the Council for the amendments to the Council Tax rates of the units, and notices from the Valuation Office appended to Peter Gbedemah's Statutory Declaration are dated to 2018 and 2016 respectively, they do not verify that Units 2 and 3 have been in continuous use for over 4 years.

The Statutory Declaration's of Naringa Figuriniate and Pawel Grejner indicate that the building previously consisted of one studio flat (unit 1) and one maisonette, with the maisonette being converted into two separate units (Units 2 and 3) in October 2014, indicating that the Units 2 and 3 have existed for a period of over 4 years and would thereby in principle be immune from enforcement action. It should be noted that the Council's Planning Enforcement department previously investigated the unauthorised change of use of the property into one studio flat (unit 1) and one maisonette, the investigation was subsequently closed, with the Council's Enforcement Officer conceding that on the balance of probability, they were satisfied that the change of use had occurred 4 years before the date of their assessment (11/06/2014). As indicated in the Planning History section of this report, there is currently and ongoing investigation on the conversion of the previously existing maisonette into two separate units (Units 2 and 3) this Certificate of Lawful Development application has been made in response to this. Within Naringa Figuriniate and Pawel Grejner's Statutory Declarations, it is emphasised that in the subdivision of the maisonette, Units 2 and 3 were separated via the installation of a locked door between the ground and first floors with Units 2 and 3 having entirely separate access doors to the front of the property, and independent kitchens and bathrooms, this is reflected in the respective floor plan drawings appended to the Statutory Declarations and Grounds for an Application for a Lawful Development Certificate document. On the balance of the probability, and given the fact that the Council do not have substantial evidence to suggest otherwise, the Council are satisfied that Units 2 and 3 have been continuously used as separate self-contained residential units for over 4 years.

In determining the lawfulness of Units 2 and 3, it is necessary to establish whether or not both Units 2 and 3 been in continuous use as C3 or C4 uses for over 4 years. The Statutory Declaration's of Pawel Grejner indicates that since they occupied the Unit 2 in May 2014 both Units 2 and 3 have always been occupied by at least one person, and never more than six. This is also emphasised in Naringa Figuriniate Statutory Declaration, who was employed to manage the site in 14/09/2014, and continues to reside there. Within the applicant's Grounds for an Application for a Lawful Development Certificate document it is emphasised that there has been an interchange in the use of the units between C3 and C4, given that both of these uses still constitute dwellinghouses, this interchange is immaterial in the assessment of the application. It should be noted that Use Class C4 relates to the use of a property as a dwellinghouse occupied by no more than 6 occupants as a House of Multiple Occupation, if more that 6 occupants were to reside in the units at any given time during the 4 year period, the unit/units would constitute a Sui Generis use, and the unauthorised subdivision of the maisonette would not be lawful. The Council do not have substantial evidence to suggest that Units 2 and 3 were occupied by more than 6 occupants at any given time since October 2014, on the balance of probability, the Council are satisfied that both Units 2 and 3 been in continuous use as C3 or C4 uses for over 4 years.

Whilst the Council's assessment of the application is principally based on the evidence submitted by the applicant in support of the Lawful Development Certificate, it should be noted that the Council

undertook a site visit on 07/03/2019 where it was observed that the submitted site plan drawings, whilst purely indicative, are reasonably accurate in their reflection of the layout of the building.

Other Matters:

It is noted that an objection has been raised to the proposal, however as an application for a Lawful Development Certificate this representation has not been formally considered in the assessment of this application.

Conclusion / Summary:

It has been evidenced beyond reasonable doubts, that Units 2 and 3 have been continuously used as two separate flats in use for multiple occupation, where occupation has fluctuated up to a maximum of 6 people and no less than one person for a period over four years.

Therefore, it is recommended that a Certificate of Lawfulness for Existing Use is **GRANTED.**

Appendix 03: Topographic Survey

Existing Site Survey Plan

Scale @ 1:200

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

REV	DATE	DESCRIPTION	INITIALS
P1	01.06.2022	Preliminary	CJB

Client: SILVER JETTY LIMITED

Project title: The Boathouse

Project address: Ranelagh Drive, Twickenham, TW1 1QZ

Drawing title: Existing Site Survey Plan

Drawing scale: 1:200 @ A3

Working number: PL-003	Revision: P1
Project number: SJ 171001	Drawn by: CJB
Date: 13.12.2021	Checked by: JA
Drawing status: PRELIMINARY	

SILVER JETTY

Appendix 04: Thames Water Asset Plans

Asset location search

Property Searches

SLR Consulting Limited
Warnford Court
29 Throgmorton Street
LONDON
EC2N 2AT

Search address supplied Waites Boat House
Ranelagh Drive
Twickenham
TW1 1QZ

Your reference Boathouse

Our reference ALS/ALS Standard/2022_4674184

Search date 5 July 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

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

0800 009 4540

Asset location search

Property Searches

Search address supplied: Waites Boat House, Ranelagh Drive, Twickenham, TW1 1QZ

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

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

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

Waste Water Services

Please provide a copy extract from the public sewer map.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

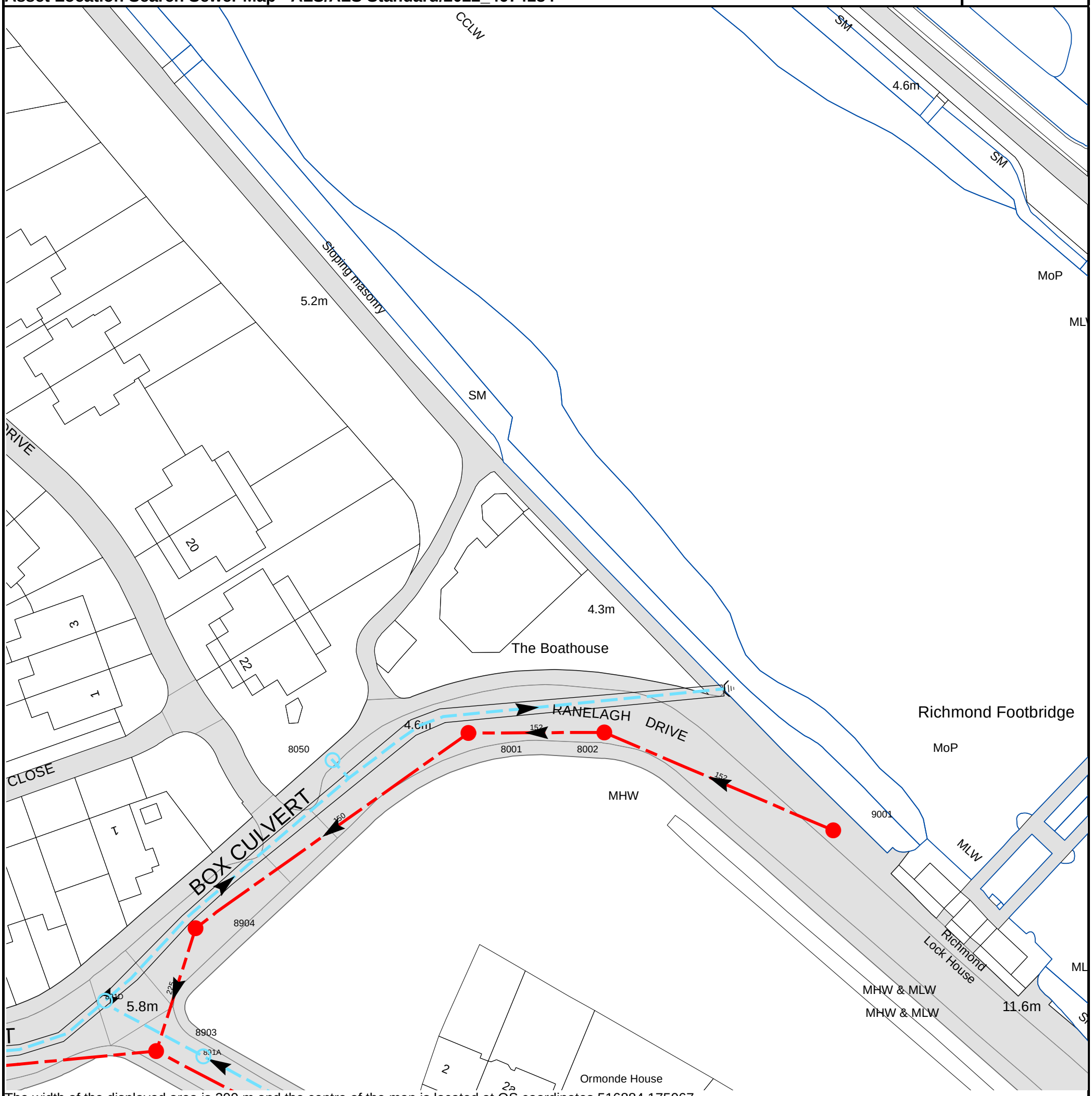
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4674184



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 516884,175067

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

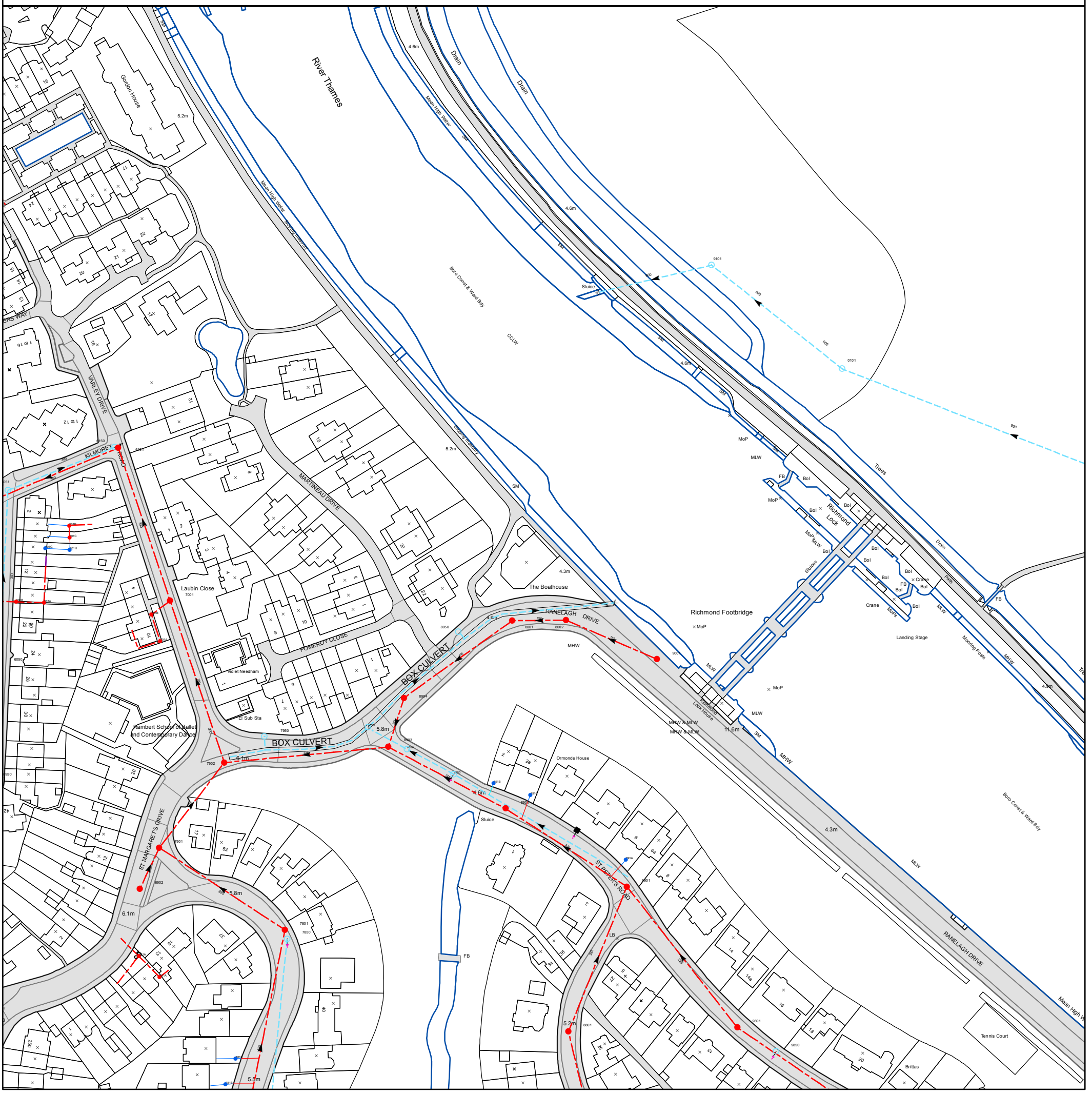
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
891A	n/a	n/a
8903	5.48	2.16
891D	n/a	n/a
8904	5.23	2.55
9001	n/a	n/a
8050	4.99	2.04
8001	4.52	2.91
8002	4.55	3.16

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

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4674184



0 10 20 40 60 80 Meters

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Scale:	1:1790
Width:	500m
Printed By:	G1KANAGA
Print Date:	05/07/2022
Map Centre:	516884,175066
Grid Reference:	TQ1675SE

Comments:

ALS/ALS Standard/2022_4674184

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
6902	5.98	4.04
8001	4.52	2.91
8002	4.55	3.16
8904	5.23	2.55
7001	6.5	1.55
7950	6.23	2.54
9850	5.93	4.26
6150	6.41	3.85
9901	5.19	2.48
7902	5.99	1.87
601C		
781C		
8901	4.56	2.29
601D		
601G		
701B		
681A		
8950	4.75	2.03
891A		
891B	4.55	3.58
891D		

REFERENCE	COVER LEVEL	INVERT LEVEL
0101		
7850	5.54	3.52
6051	6.34	3.79
7901	5.85	2.3
7801	5.59	2.64
9801	5.88	2.7
8050	4.99	2.04
8801	5.31	2.7
9101		
6101	6.39	1.33
781B		
781A		
601B		
601A		
601H		
701A		
991A		
9001		
8903	5.48	2.16
891C	4.6	2.6

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

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

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

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

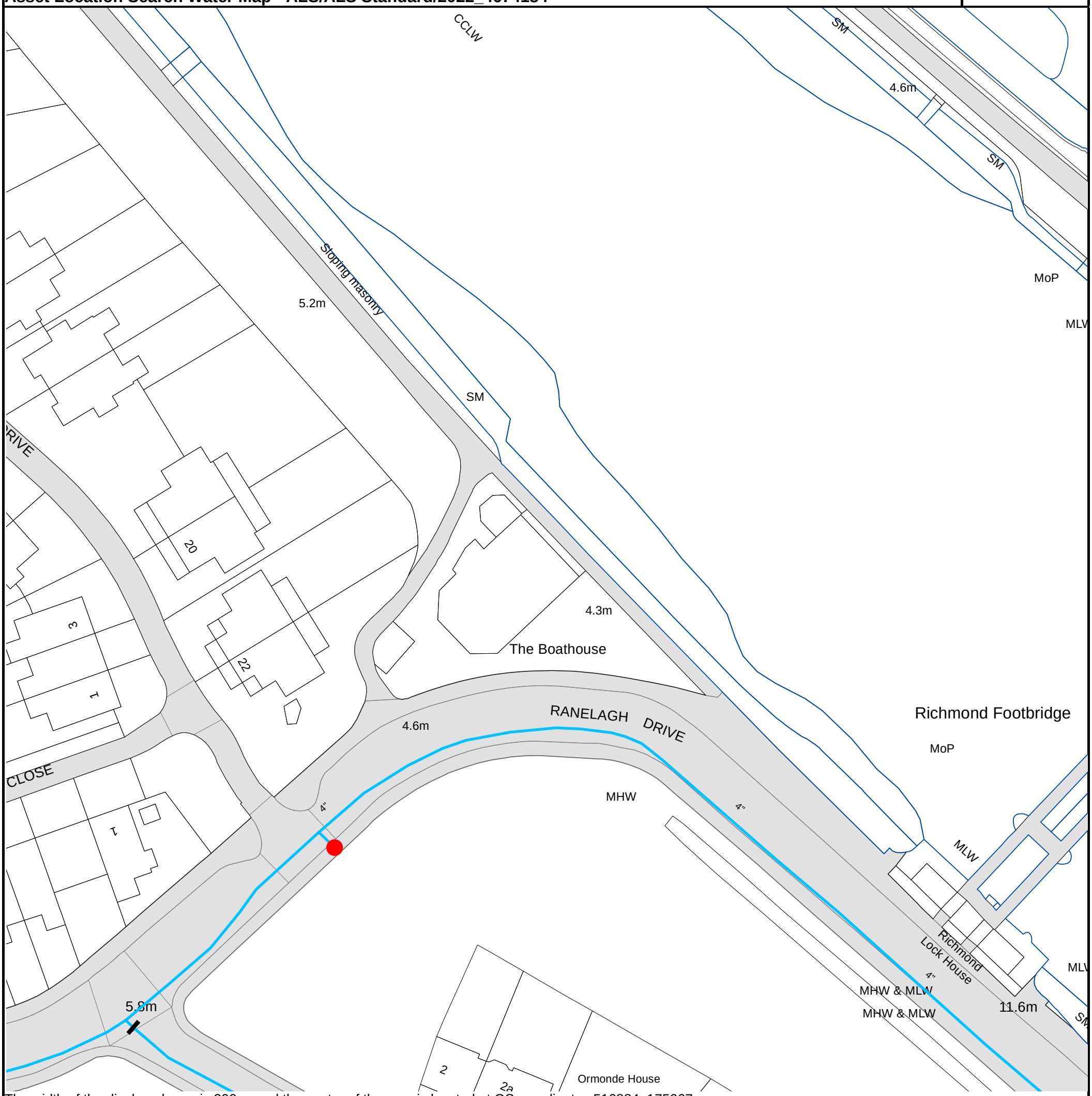
- Conduit Bridge
- Subway
- Tunnel

Notes:

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

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

Asset Location Search Water Map - ALS/ALS Standard/2022_4674184



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 516884, 175067.

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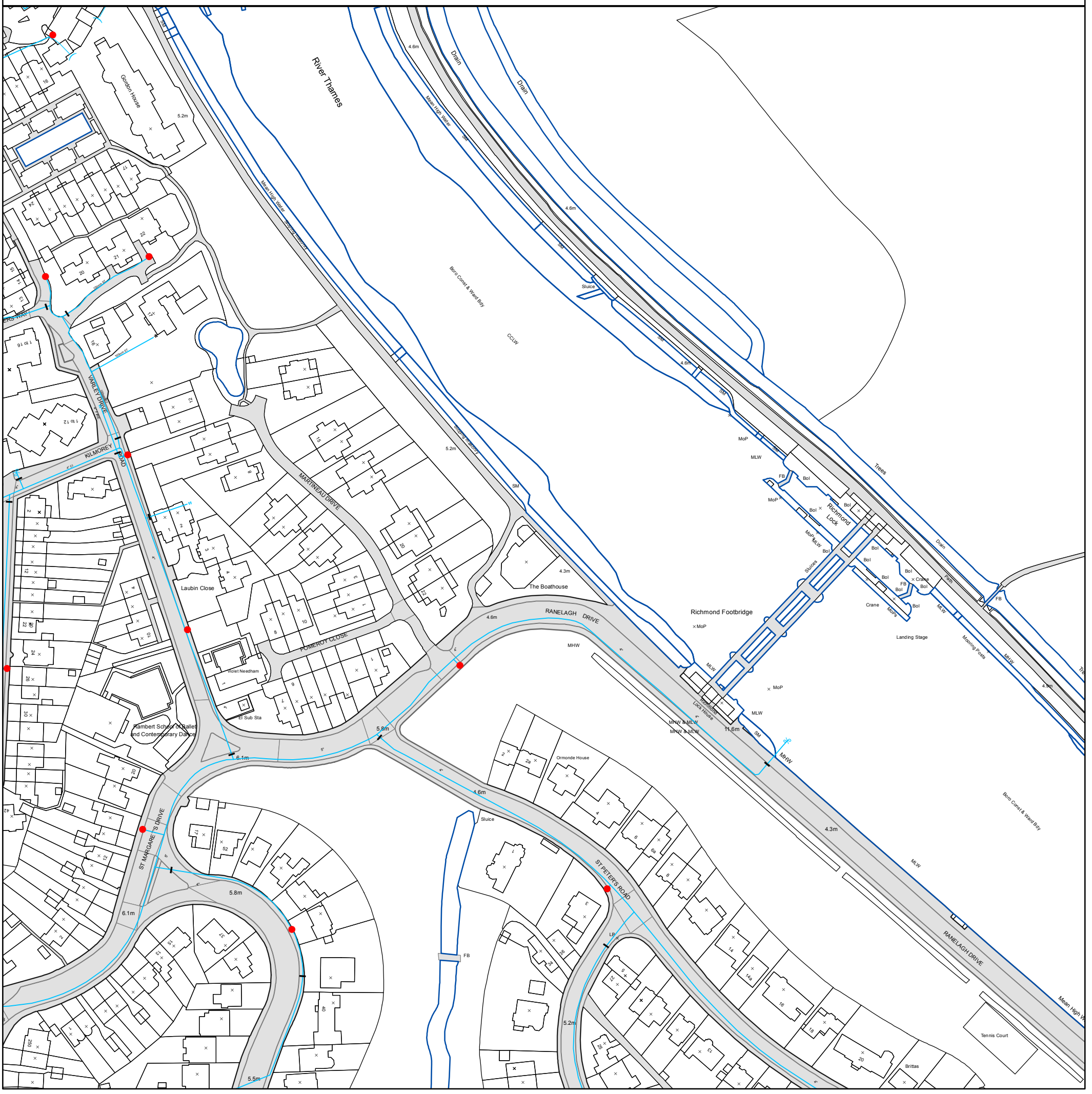
Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4674184



0 10 20 40 60 80 Meters

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

Scale:	1:1790
Width:	500m
Printed By:	G1KANAGA
Print Date:	05/07/2022
Map Centre:	516884,175066
Grid Reference:	TQ1675SE

Comments:

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

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

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

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

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

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

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

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

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

Valves

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

Hydrants

- Single Hydrant

Meters

- Meter

End Items

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

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

Operational Sites

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

Other Symbols

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

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

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

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

Terms and Conditions

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

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

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

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix 05: Environment Agency Flood Product 4

Product 4 (Detailed Flood Risk) for: **516878,175059**
Reference: **HNL 271714 JH**
Date: 20/07/2022

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

Please refer to the Open Government Licence which explains the permitted use of this information.

Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE
Customer services line: 03708 506 506
Email: NETenquiries@environment-agency.gov.uk
Website: www.environment-agency.gov.uk

Flood Map for Planning (Rivers and Sea)

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. In addition, the map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at https://www.gov.uk/check-flood-risk

At this Site:

The Flood Map shows that this site:

lies within Flood Zone 3 - with a 1% chance of flooding from rivers (fluvial flooding) and a 0.5% chance of flooding from the sea (tidal flooding) in any given year
Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed modelling of the tidal River Thames through the

- Thames Tidal Defences Study completed in 2006 by Halcrow Ltd.

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Thames Estuary 2100 (TE2100)

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the Thames Estuary 2100 study completed by HR Wallingford in 2008. The modelled Thames node closest to your site is **2.8**; the locations of nearby nodes on the River Thames are also shown on the enclosed map.

Details about the TE2100 plan

The Plan sets out how the Environment Agency and our partners can work together to manage tidal flood risk, from now until the end of the century. It is an adaptive plan for managing the Thames Estuary, including the tidal defence system, until 2100 so that current standards of flood protection are maintained or improved taking into account climate change effects e.g. sea level rise. The Plan has 3 phases of activity:

- Until 2035 – maintain and improve current defences, safeguard areas required for future improvements, and monitor climate change indicators.
- 2035-2050 – raise existing walls, defences & smaller barriers whilst reshaping the riverside environment.
- 2050-2100 – determine and implement an option for the future of the Thames Barrier, and adapt other defences as required to work alongside this to protect the estuary.

The Thames Estuary 2100 Plan can be found at: https://www.gov.uk/government/publications/thames-estuary-2100-te2100

Details about the TE2100 in-channel levels

The TE2100 in-channel levels take into account operation of the **Thames** Barrier when considering future levels. The **Thames** Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels – for which the Barrier would normally shut for the 2008 epoch – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upriver of the barrier will increase and the tidal walls will need to be heightened to match.

Why is there no return period for levels upriver of the barrier? -

The levels upriver of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked and the river maintained to a low level. For this reason the probability of any given water level upriver of the Barrier is controlled and therefore any associated return period becomes irrelevant. The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has a 0.1% annual probability. The probability of water levels upriver is ultimately controlled by the staff at the Thames Barrier.

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TE2100 2008 levels:

Levels downriver of the Thames Barrier are 0.1% AEP (1 in 1000) and levels upriver are the highest levels permitted by the Thames Barrier, described as the Maximum Likely Water Levels (MLWLs). The defence levels (left defence, right defence) are the minimum levels to which the defences should be built.

Node	Easting	Northing	Extreme water level (m)	Present Day Statuatory Defence Level (Thames Left Bank) (m)	Allow for future 2100 defence raising to a level of... (Thames Left Bank)
2.8	516863	175134	5.59	5.94	6.70
2.81	516864	175180	5.59	5.94	6.70
2.9u	516742	175353	5.54	5.94	6.70
2.9d	516766	175416	5.54	5.94	6.70

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TE2100 climate change levels:

			2065 to 2100		2100	
Node	Easting	Northing	Design water level	Defence level (both banks)	Design water level	Defence level (both banks)
2.8	516863	175134	5.84	6.25	6.29	6.70
2.81	516864	175180	5.84	6.25	6.29	6.70
2.9u	516742	175353	5.83	6.25	6.28	6.70
2.9d	516766	175416	5.83	6.25	6.28	6.70

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TE2100 flood levels:

Upstream of the Thames Barrier, the levels provided are the highest levels permitted by the Barrier.
Downstream of the Thames Barrier they are the 1 in 1000 (0.1%) levels.

In West London, there is a heavy influence from upstream (fluvial) flows. The flood defences are built to manage tidal flood risk only. With very high fluvial flows, the river levels in west London could be above the tidal defence level.

Location	Node	Easting	Northing	Present Day Water Level	Future 2065-2100 Water Level	Future 2100 Water Level
	2.6	517278	174807	5.64	5.87	6.32
	a2.6	517173	174880	5.63	5.86	6.31
Richmond	a2.7	517026	174968	5.61	5.85	6.3

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TE2100 defence levels:

The table below shows both the current defence level, and the TE2100 plan future defence levels. New development should either include future defence raising or demonstrate that future raising has been allowed for.

Note: The defence levels near Teddington may be lower than the water levels because they take into account high fluvial events. The defences are tidal only.

Location	Node	Easting	Northing	Current Defence Levels		Allow for future defence raising (both banks) to a level of...	
				Left	Right	2065-2100	2100
	2.6	517278	174807	5.94	5.94	6.45	6.90
	a2.6	517173	174880	5.94	5.94	6.45	6.90
Richmond	a2.7	517026	174968	5.94	5.94	6.45	6.90

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Thames Tidal Upriver Breach Inundation Modelling – 2017 Upstream

- The map attached displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Upriver Breach Inundation Modelling Study 2017 completed by Atkins Ltd. in May 2017.

We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2005 and 2100 epochs were modelled on that basis.

This modelling has two epochs to consider; the 2005 epoch is a representation of today's flood levels without climate change considerations taken into account, and the 2100 epoch which takes into account changes likely to be seen due to climate change.

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Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year **tidal** flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure that they are maintained to a crest level of **6.02** mAODN (the Statutory Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

There are no planned improvements in this area. Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

https://www.gov.uk/government/publications/thames-estuary-2100-te2100

Areas Benefiting from Flood Defences

This site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

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Recorded Flood Events Data

a) We do not hold records of historic flood events from rivers and/or the sea affecting the area local to this site.
However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

Other Sources of Flood Risk

The Lead Local Flood Authority for your area are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse) and may hold further information .

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources.

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Additional Information

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

https://www.gov.uk/flood-risk-standing-advice-frsa-for-local-planning-authorities

https://www.gov.uk/government/publications/national-planning-policy-framework-technical-guidance

https://www.gov.uk/government/publications/development-and-flood-risk-practice-guide-planning-policy-statement-25

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.

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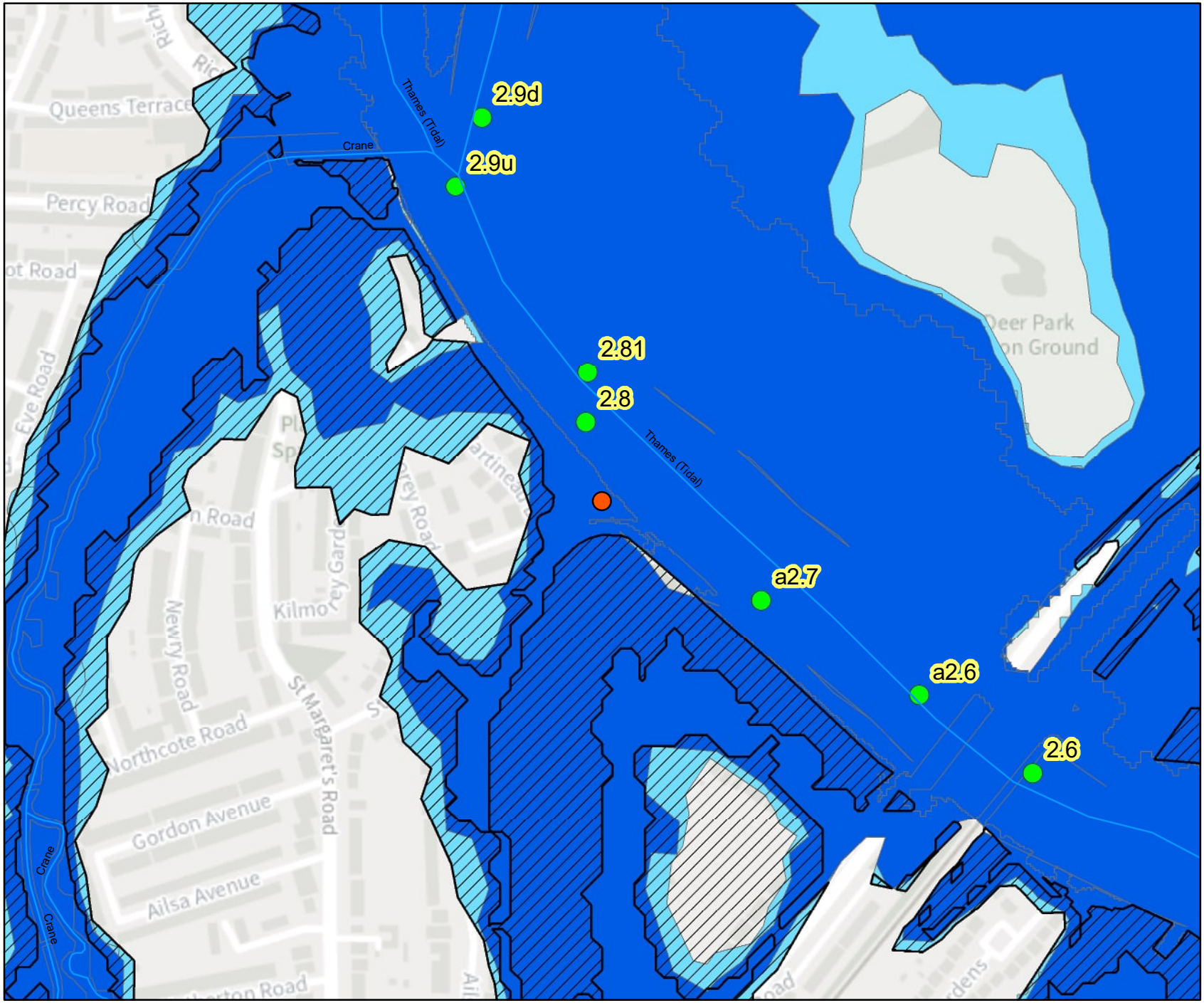
Detailed FRA/FCA for: 516878,175059 - 19/07/2022 - HNL 271714 JH



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 75 150 300
Metres

Legend

- Main Rivers
- Site location
- TE2100Nodes
- 1707 Flood Outline
- 1928 Flood Outline
- 1953 Flood Outline
- Areas Benefiting from Flood Defences
- FZ3
- FZ2

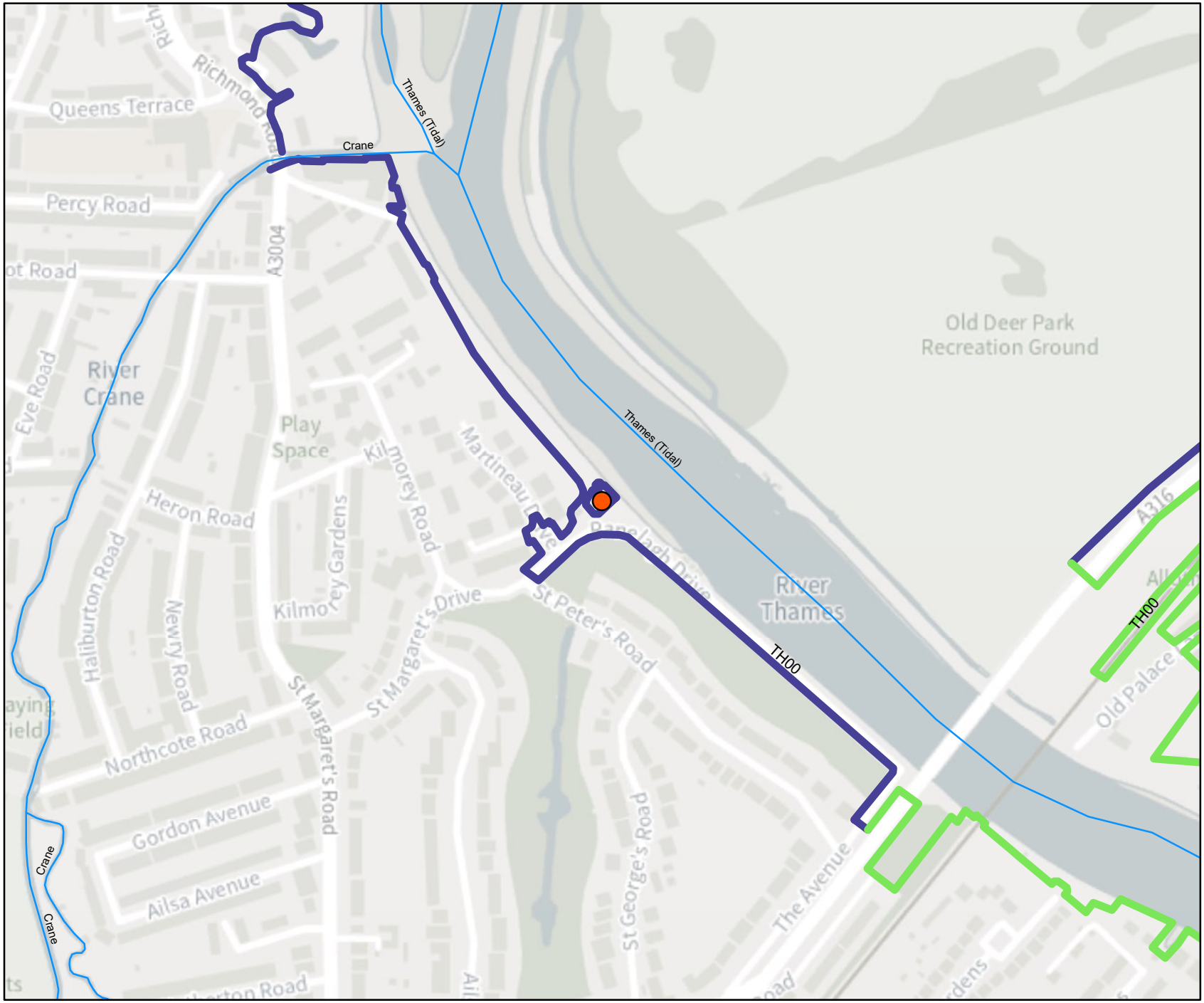
Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Detailed FRA/FCA for: 516878,175059 - 19/07/2022 - HNL 271714 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 75 150 300

Metres

Legend

- Main Rivers
- Site location

TTD Defences SDL (mAODN)

SDL

- 5.94
- 6.02

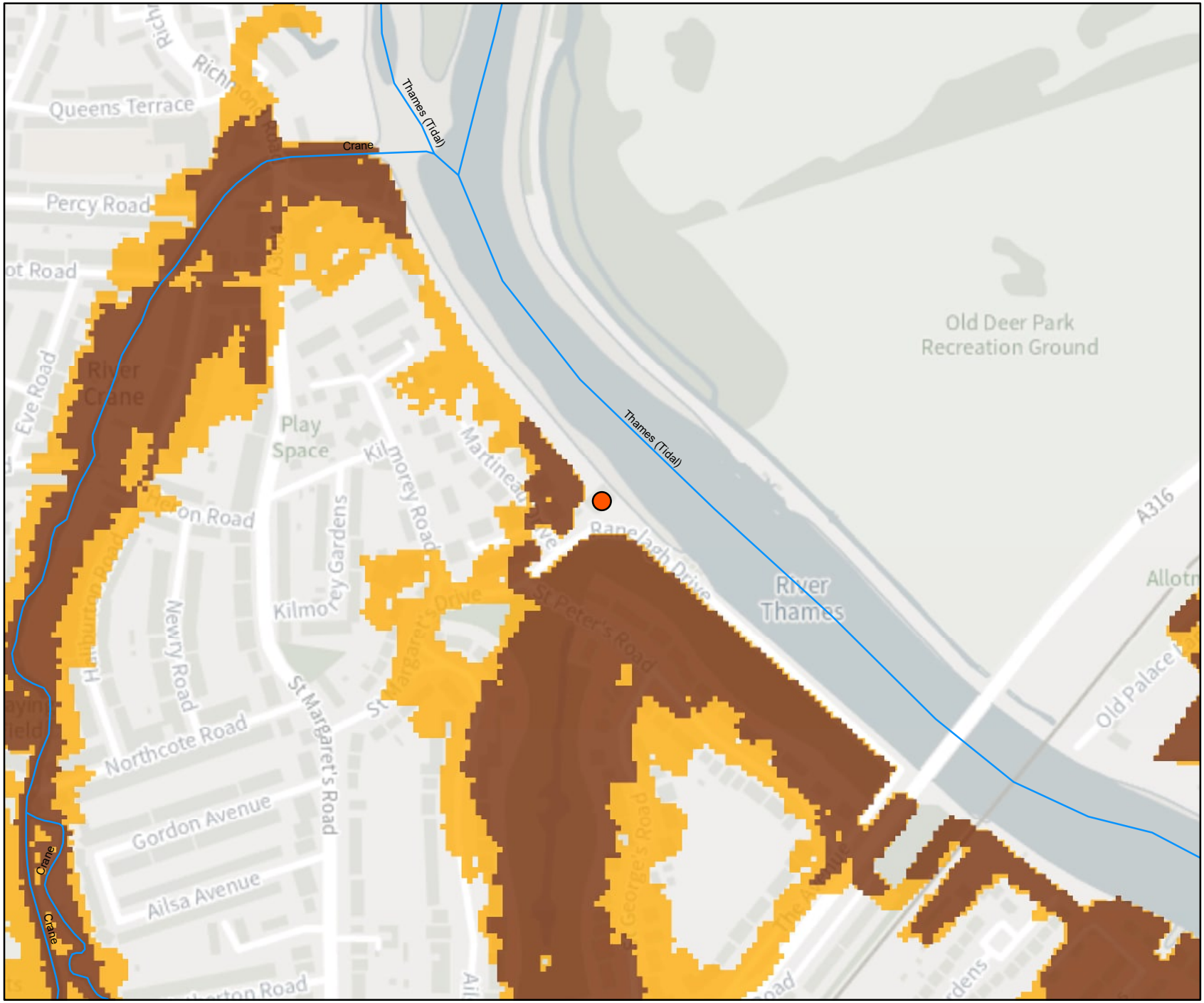
Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Breach Modelling Map for: 516878,175059 - 19/07/2022 - HNL 271714 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 75 150 300

Metres

Legend

- Main Rivers
- Site location

Upstream Breach Outlines

Epoch

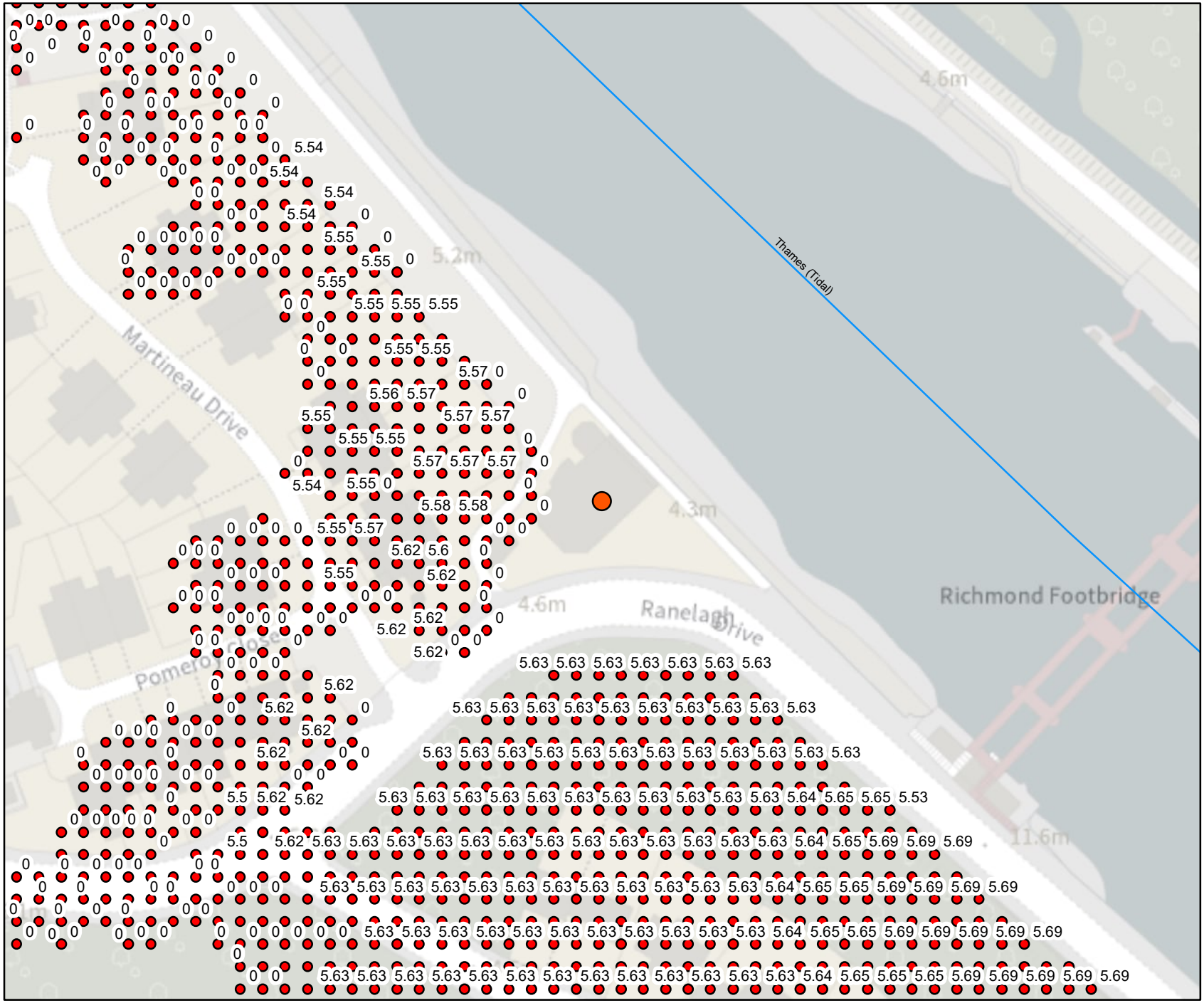
- 2005
- 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Modelled Flood Levels For: 516878,175059 - 19/07/2022 - HNL 271714 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

- Main Rivers
- Site location

2D Node Results: Heights

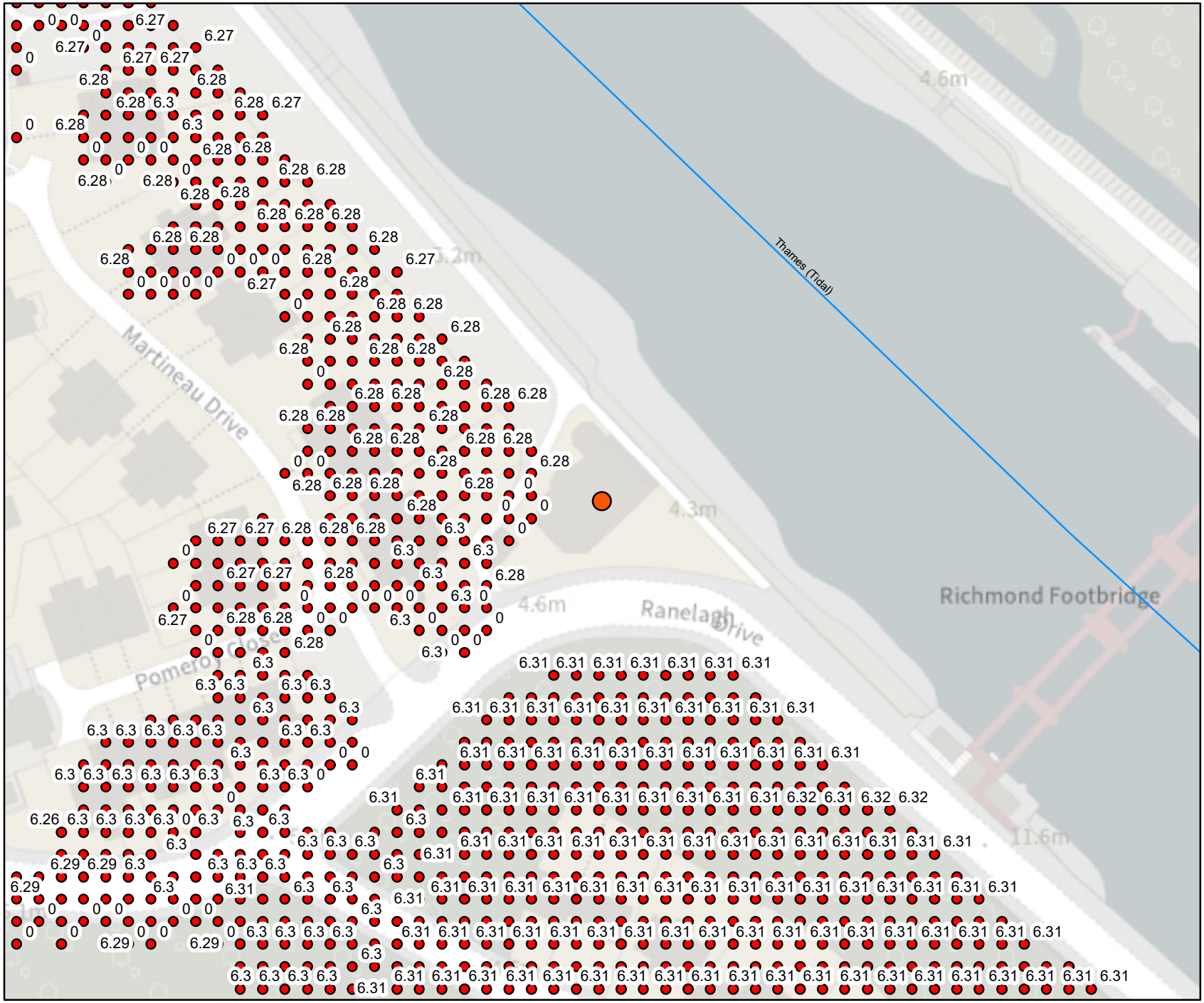
- Tidal Breach Height (mAOD) 2005

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Modelled Flood Levels For: 516878,175059 - 19/07/2022 - HNL 271714 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

- Main Rivers
- Site location

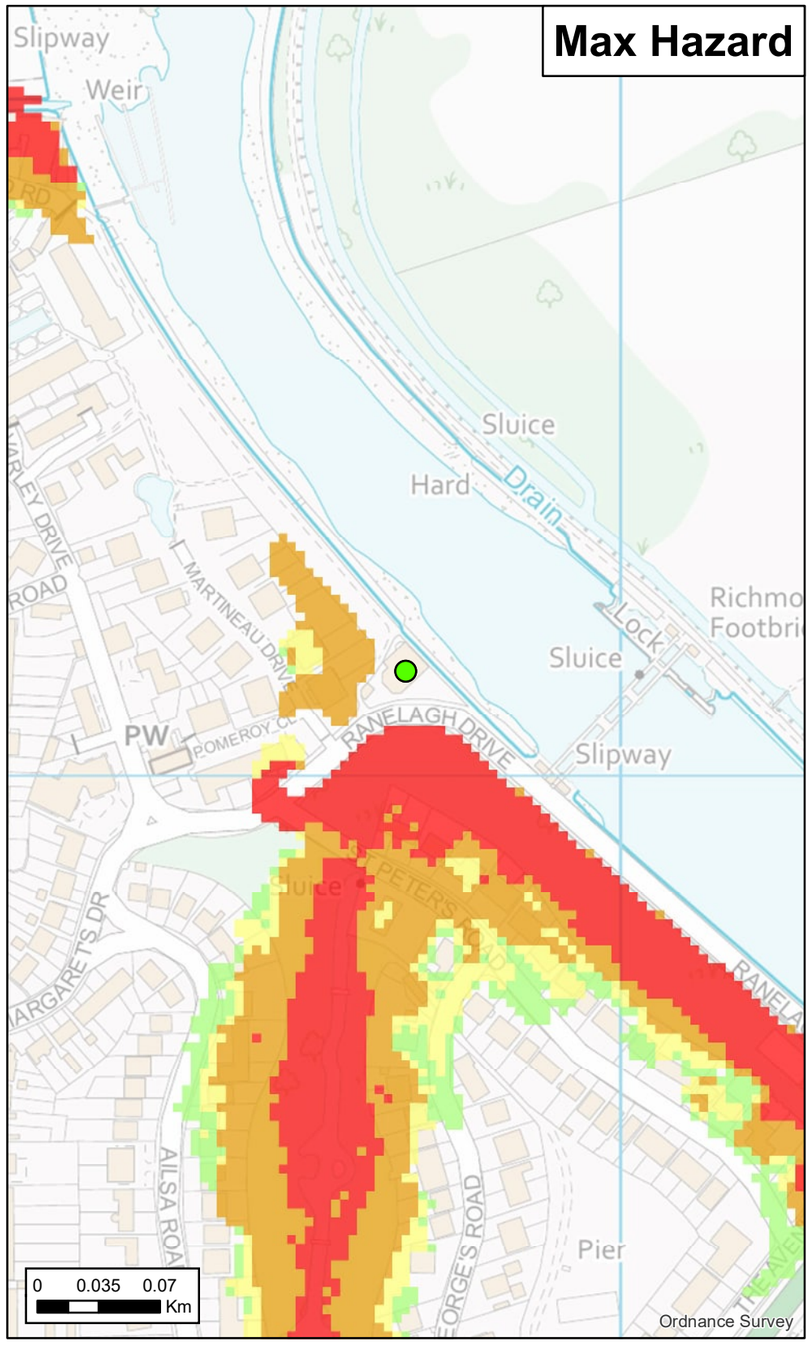
2D Node Results: Heights

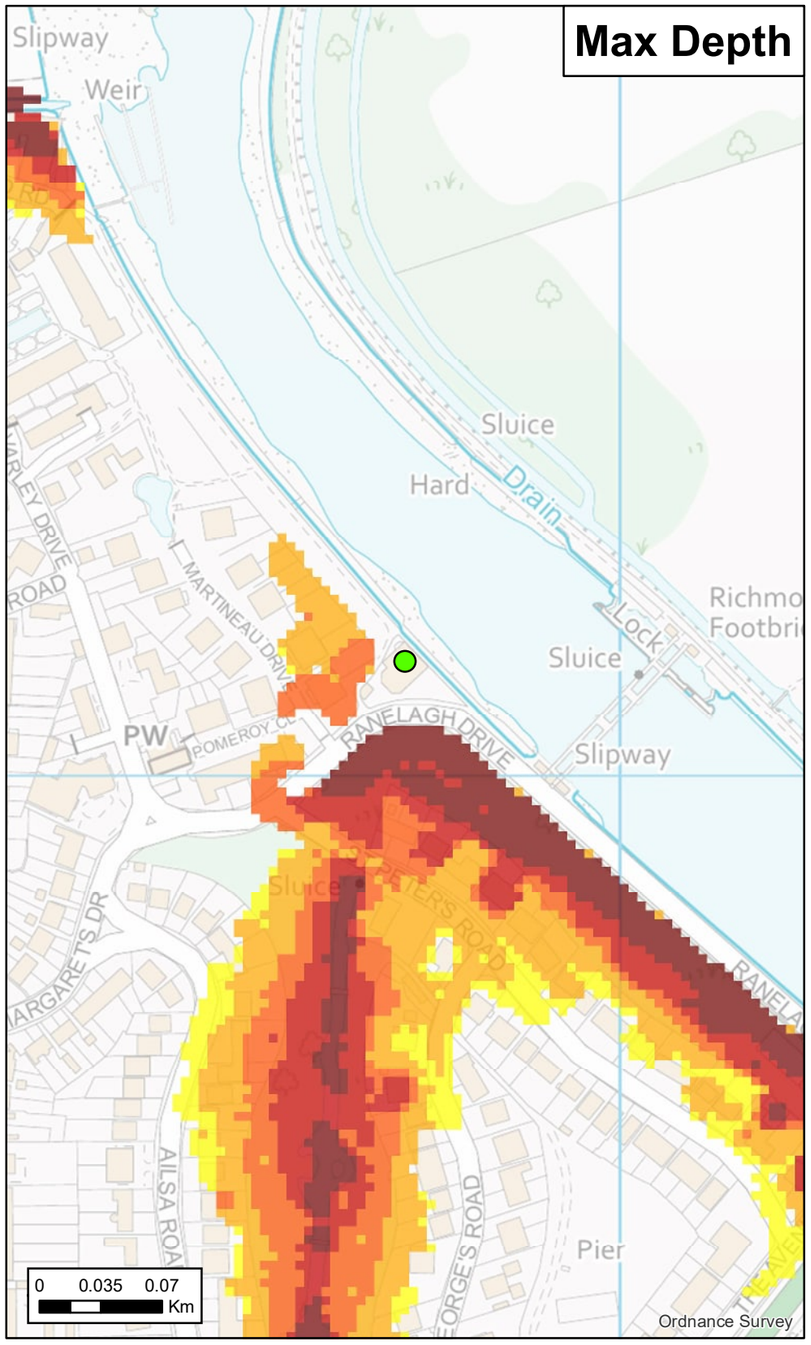
- Tidal Breach Height (mAOD) 2100

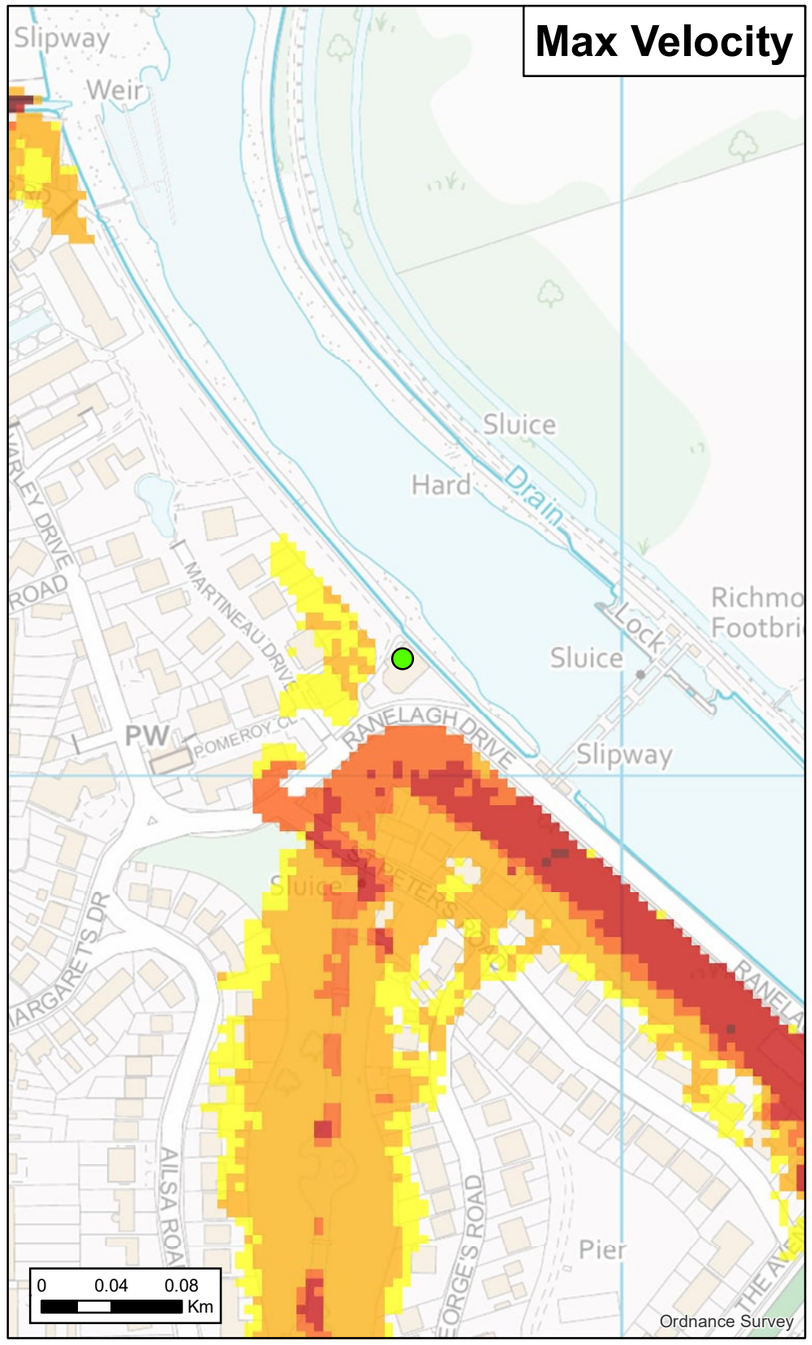
Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London







Max Hazard

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	26/04/2022	**Scenario year**	2005	**Scenario Annual Chance**	0.5% (1 in 200)

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

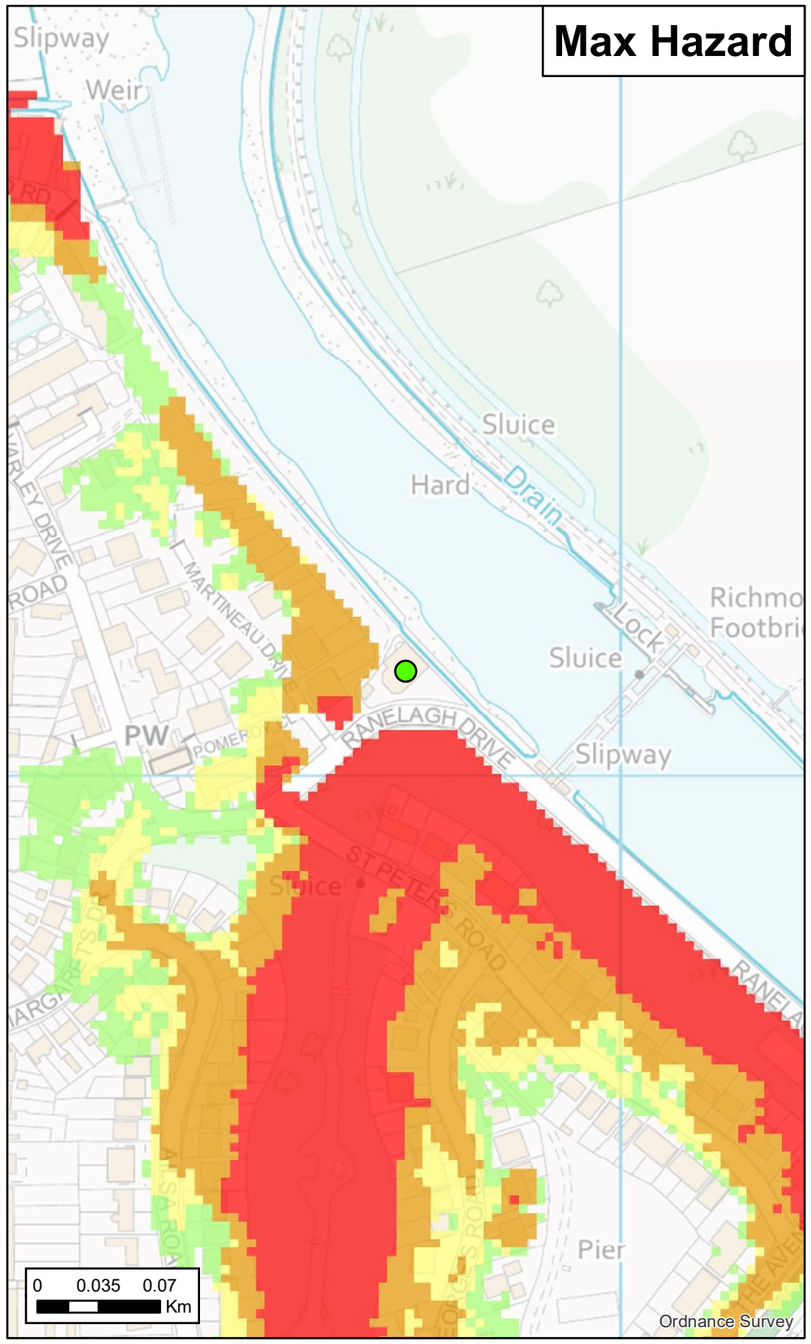
Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

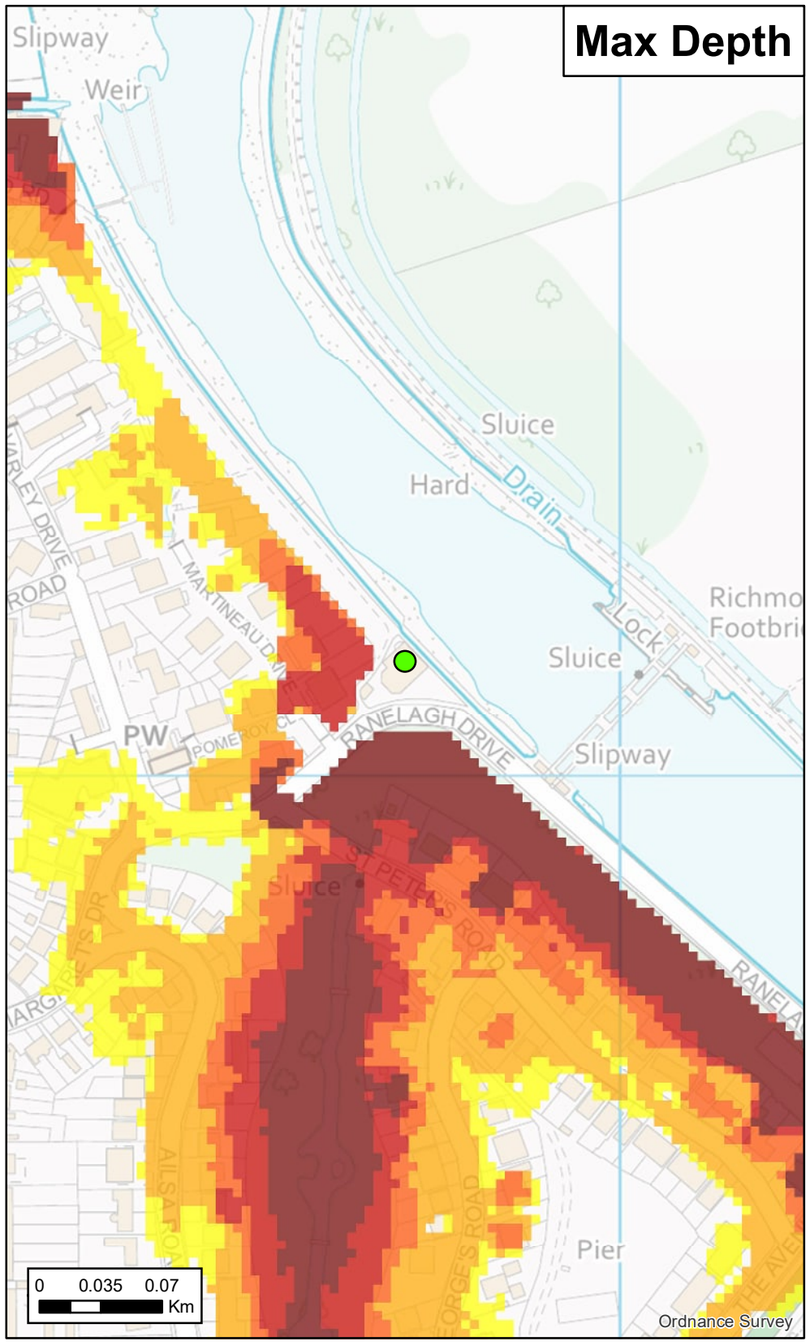
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

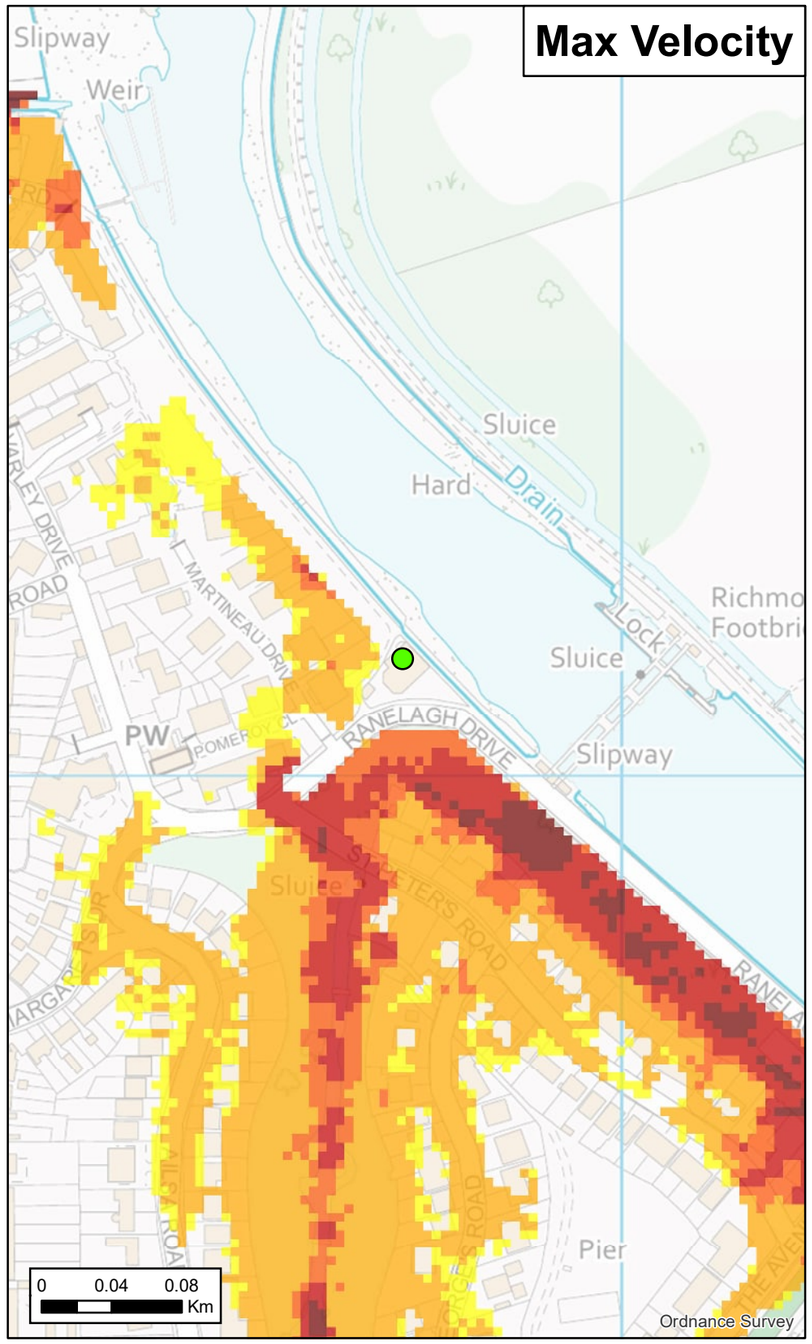
Environment Agency

Thames Tidal Breach Hazard Mapping

Map Centred on 529101, 178218







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- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	26/04/2022	Scenario year	2100	Scenario Annual Chance	0.5% (1 in 200)

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

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Environment Agency

Thames Tidal Breach Hazard Mapping

Map Centred on 529101, 178218

Appendix 06: Current and Proposed Ground Models

N

PROPOSED SITE STORAGE	
Elevation	Int. fill
5.420	
	58.0
5.320	
	33.1
5.220	
	11.9
5.120	
	6.4
5.020	
	4.5
4.920	
	3.2
4.820	
	2.2
4.720	
	1.4
4.620	
	0.7
4.520	
	0.1
4.420	
	0.0
4.320	
	0.0
4.220	

NOTES

BASE SURVEY TAKEN FROM SILVER JETTY LIMITED, EXISTING SITE SURVEY, DRG No. PL-003, DATED 02.09.2022, REV P1 30.09.2022

LEGEND

SITE BOUNDARY

Height ranges

6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
5.0
4.8
4.6
4.4
4.2

0 1 2 3 4m 6 8 10

Metres 1:100

Revision	By	Chk'd By	Date	Comments
1	AB	DW	01/23	inlusion of inner wall
0	AB	DW	01/23	

PETER GBEDEMAH

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CARDIFF
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www.slrconsulting.com

Site
THE BOAT HOUSE
TWICKENHAM

Project
FLOOD RISK ASSESSMENT

Drawing Title
EXISTING SITE PLAN

Scale
1:100 @A1

Date
JANUARY 2023

Drawing Number
003

Revision
1

N

4.96m

5.10m

River Thames

River side walk

5.10m

4.70m

5.10m

River Thames

4.88m

River side walk

0 1 2 3 4m 6 8 10

Metres 1:100

PROPOSED SITE STORAGE	
Elevation	Int. fill
5.420	
	62.3
5.320	
	62.3
5.220	
	58.0
5.120	
	28.8
5.020	
	18.3
4.920	
	13.8
4.820	
	8.4
4.720	
	6.8
4.620	
	6.0
4.520	
	5.1
4.420	
	4.2
4.320	
	1.9
4.220	

NOTES

BASE SURVEY TAKEN FROM SILVER JETTY LIMITED, EXISTING SITE SURVEY, DRG No. PL-003, DATED 02.09.2022, REV P1 30.09.2022

LEGEND

SITE BOUNDARY

Height ranges

6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
5.0
4.8
4.6
4.4
4.2

Revision	By	Chk'd By	Date	Comments
1	AB	DW	01/23	Revised levels
0	AB	DW	01/23	

PETER GBEDEMAH

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HELMONT HOUSE
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CARDIFF
CF10 2DY
T: 029 2049 1010
www.slrconsulting.com

Site
THE BOAT HOUSE
TWICKENHAM

Project
FLOOD RISK ASSESSMENT

Drawing Title
PROPOSED SITE PLAN

Scale
1:100 @A1

Date
JANUARY 2023

Drawing Number
004

Revision
1

425.064470.00001.18.004.1 Proposed levels.dwg

Appendix 07: Plans showing existing building against proposed building footprint

River Thames

River side walk

Existing site entrance

Existing and Proposed Building Flood Defence Diagram

Scale @ 1:100

Scale Bar

0 1m 2m 3m 4m 5m 10m

Existing Building Flood Defence Zone
512 m² - 5511 sqft

Existing area raised above fluvial flood level
43.71 m² - 470.4 sqft

Proposed Building Flood Defence Zone - Datum 6.900
513 m² - 5521 sqft

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

Notes:

REV	DATE	DESCRIPTION	INITIALS
P1	30.09.2022	PLANNING ISSUE	CJB

Client: SILVER JETTY LIMITED

Project title: The Boathouse

Project address: Ranelagh Drive, Twickenham, TW1 1QZ

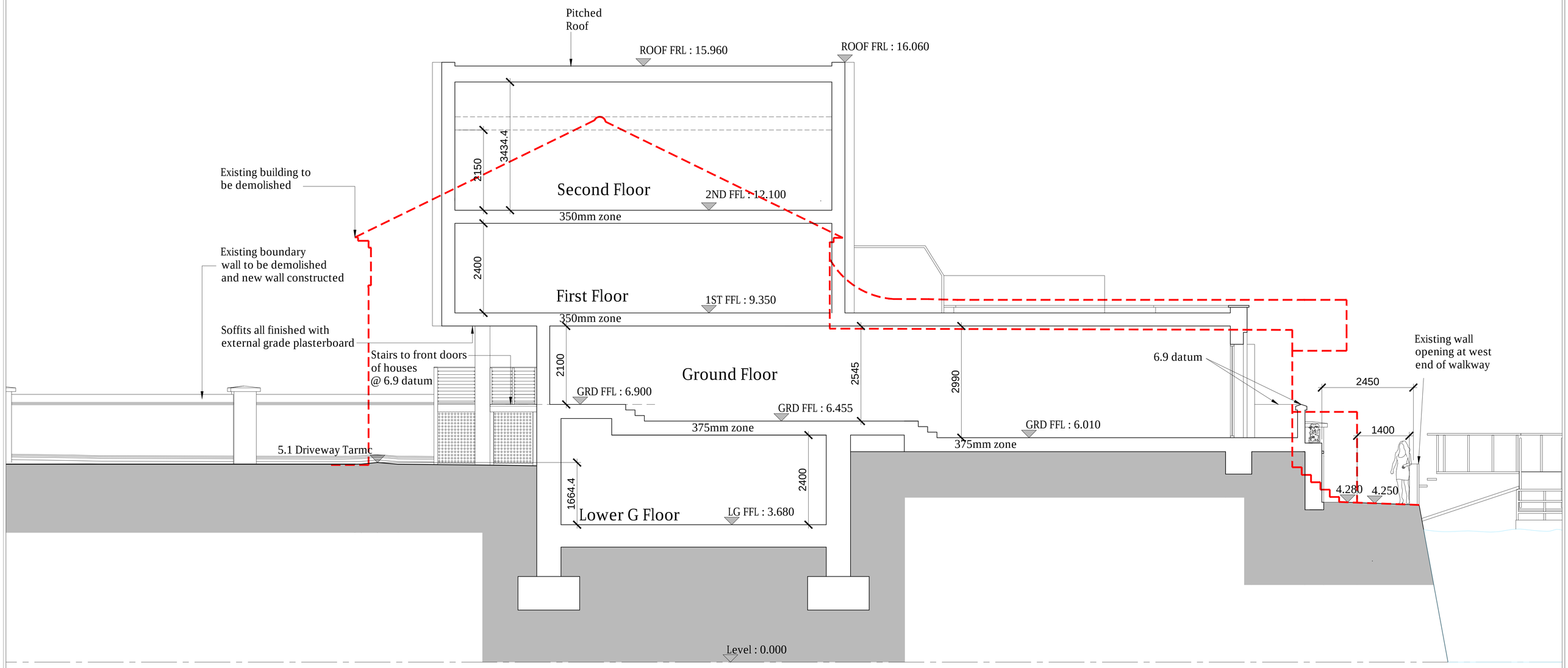
Drawing title: Existing and Proposed Building Flood Defence Diagram

Drawing scale: 1:100 @ A1

Drawing number: PL-210	Revision: P1
Project number: SJ 171001	Drawn by: CJB
Date: 02.09.2022	Authorised by: JA
Drawing status: PLANNING	

SILVER JETTY

Appendix 08: Proposed Section AA drawing, Drawing number PL-060, project number SJ171001, dated 30.08.2022



Proposed Section AA

Scale @ 1:50

Notes:

Scale Bar

0 1m 2m 3m 5m

General Notes

This drawing is to be read in conjunction with all relevant design team specifications and drawings.
All dimensions are to be checked on site prior to commencement of work any discrepancies reported to the Project Architect.
All materials and components are to be handled, stored, protected, installed and finished strictly in accordance with the manufacturer's recommendations.

REV	DATE	DESCRIPTION	INITIALS
P4	31.05.2023	PLANNING ISSUE	CJB

Client: The Boathouse Twickenham Limited

Project title: The Boathouse

Project address: Ranelagh Drive
Twickenham
TW1 1QZ

Drawing title: Proposed Section AA

Drawing scale: 1:50 @ A1

Drawing number: PL-060

Revision: P4

Project number: SJ 171001

Drawn by: CJB

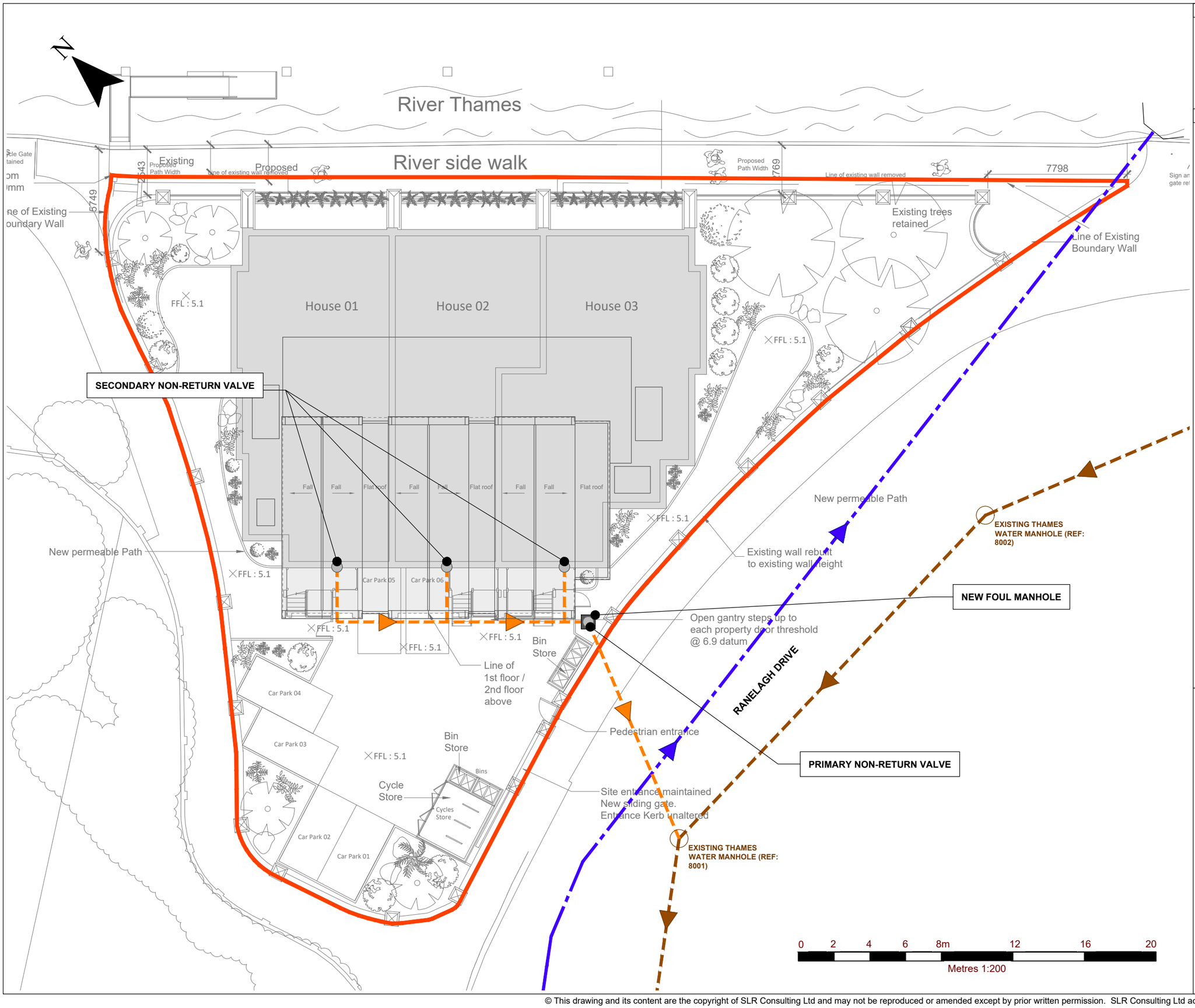
Date: 30.08.2022

Checked by: JA

Drawing status: PLANNING

SILVER JETTY

Appendix 09: Indicative location of non-return valves



NOTES

1. DRAWING IS BASED ON SILVER JETTY LTD PROPOSED SITE PLAN, REFS: SJ 171001 PL-040 REV P3, DATED: 31.03.2023.

LEGEND

- SITE BOUNDARY
- BUILDING FOOTPRINT
- EXTENT OF ROOF
- EXISTING THAMES WATER SURFACE WATER SEWER
- EXISTING THAMES WATER FOUL SEWER
- NEW MANHOLE
- NON-RETURN VALVE
- PIPED CONNECTION

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THE BOAT HOUSE
TWICKENHAM

FOUL WATER DRAINAGE STRATEGY

FOUL WATER DRAINGE PLAN

DRAWING 02

Scale	Date
1:200 @ A3	JUNE 2023

425.064470.00001.18.002.1_FOUL_DRAINAGE.dwg

Appendix 10: London Borough of Richmond upon Thames SuDS Pro-Forma

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	The Boathouse, Twickenham
Address & post code	The Boathouse, Ranelagh Drive, Twickenham, TW1 1QZ
OS Grid ref. (Easting, Northing)	E 516879
	N 175062
LPA reference (if applicable)	
Brief description of proposed work	demolition of the existing building and the construction of a residential scheme comprising 3 properties with associated hardstanding and soft landscaping
Total site Area	1175 m^2
Total existing impervious area	1175 m^2
Total proposed impervious area	940 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Assumed discharge into Thames Water Sewer beneath Ranelagh Road
Designer Name	Chloe Nelson
Designer Position	Project Hydrologist
Designer Company	SLR Consulting

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Secondary B (undifferentiated)	
Bedrock geology classification	Unproductive	
Site infiltration rate	N/A	m/s
Depth to groundwater level	c.0.77	m below ground level
Is infiltration feasible?	No	

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Thames Water Sewer using the existing (or if not possible, new) manhole connection at around NGR: TQ168750
Has the owner/regulator of the discharge location been consulted?	No

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER**LONDON**AUTHORITY

LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar				
1 in 1				
1 in 30				
1 in 100				
1 in 100 + CC				
Climate change allowance used		40%		
3b. Principal Method of Flow Control		N/A - Piped outflow for discharging into tidal watercourse		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	470	79	2.4
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	705	322	29
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		60
Total	**1175**	**549**	**104.7**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 2.4
Drainage hierarchy (2b)	Section 6.4
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix 06
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 6.7
Proposed SuDS measures & specifications (3b)	Section 6.6
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix 01
Detailed drainage design drawings, including exceedance flow routes	Appendix 06
Detailed landscaping plans	Appendix 01
Maintenance strategy	Section 6.10
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Green Roof, Permeable Paving
b) biodiversity?	Green Roof
c) amenity?	Vegetative Planting Sitewide

Appendix 11: Surface Water Drainage Drawing

River Thames

River side walk

Existing Proposed Path Width

Proposed Path Width

Line of existing wall removed

Line of existing wall removed

Existing trees retained

Line of Existing Boundary Wall

Sign and gate retained

5749

5743

7769

7798

House 01 House 02 House 03

Fall Fall Flat roof Fall Fall Flat roof Fall Fall Flat roof

FFL : 5.1

Car Park 05 Car Park 06

Car Park 04 Car Park 03 Car Park 02 Car Park 01

Bin Store

Cycle Store

Cycles Store

Bins

RANELAGH DRIVE

New permeable Path

New permeable Path

Existing wall rebuilt to existing wall height

Open gantry steps up to each property door threshold @ 6.9 datum

Line of 1st floor / 2nd floor above

Pedestrian entrance

Site entrance maintained New sliding gate. Entrance Kerb unaltered

PERMEABLE PAVING

COVER LEVEL:	**5.10m AOD**
INVERT LEVEL:	**4.65m AOD**
SURFACE AREA:	**322m²**
MEMBRANE DEPTH:	**150mm**
DEPTH OF GRAVELS:	**300mm**
VOID RATIO:	**0.3**
VOLUME AVAILABLE:	**29m³**

NON RETURN VALVE

NEW MANHOLE CONNECTION INTO THAMES WATER SURFACE WATER SEWER WITH AN ASSUMED INVERT LEVEL OF 1.3m AOD. EXISTING POINT OF CONNECTION TO BE ADOPTED IF FEASIBLE

BELOW GROUND TANK

COVER LEVEL:	**5.1m AOD**
SOFFIT LEVEL:	**4.3m AOD**
INVERT LEVEL:	**3.0m AOD**
SURFACE AREA:	**62m²**
VOLUME AVAILABLE:	**74.4m³**
INVERT LEVEL OF RECEIVING SEWER:	**c. 1.3m AOD**

0 2 4 6 8m 12 16 20

Metres 1:200

NOTES

1. DRAWING IS BASED ON SILVER JETTY LTD PROPOSED SITE PLAN, REFS: SJ 171001 PL-040 REV P3, DATED: 31.03.2023.

LEGEND

- SITE BOUNDARY
- BUILDING FOOTPRINT
- EXTENT OF ROOF
- GREEN ROOF
- PERMEABLE PAVING
- BELOW GROUND TANK
- PIPED CONNECTION
- EXITING THAMES WATER SURFACE WATER SEWER
- NEW MANHOLE
- NON RETURN VALVE
- EXCEEDANCE ROUTE
- FLOW DIRECTION

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THE BOAT HOUSE TWICKENHAM

SURFACE WATER DRAINAGE STRATEGY

SURFACE WATER DRAINGE PLAN

DRAWING 01

Scale 1:200 @ A3

Date JUNE 2023

425.064470.00001.18.001.1_SW_DRAINAGE.dwg

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