GeoSmart Information

FloodSmart

Flood Risk Assessment

Site Address

16 Strawberry Hill
Twickenham
Richmond upon Thames
TW1 4PT

Grid Reference

515591, 172272

Report Prepared for

Allan Vaz

Date

2024-09-05

Report Status

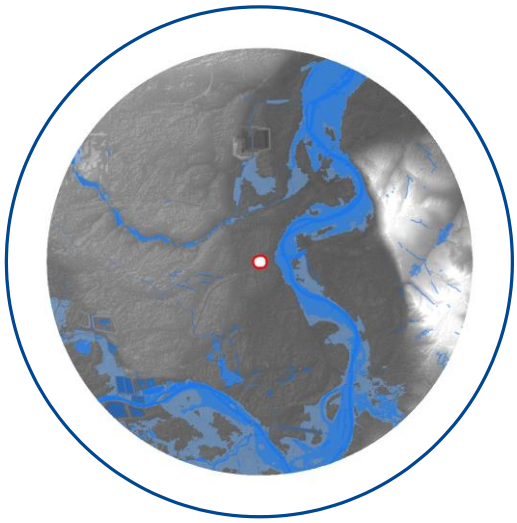
FINAL

Site Area

0.13 ha

Report Reference

82632R1



Risk – Very Low

The Site is located in Flood Zone 1 (Low probability of flooding from fluvial and tidal sources) with a Very Low flood risk when taking into account the presence of flood defences.

The Site is at a Very Low risk of flooding surface water (pluvial). A negligible risk of flooding has been identified from groundwater and from artificial sources (i.e. canals, reservoirs and sewers).

Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.

Report Author

Warren Roberts

Consultant

Report Checker & Reviewer

James Robinson

Senior Consultant

GeoSmart Information Ltd
Suite 9-11, 1st Floor, Old Bank Buildings,
Bellstone, Shrewsbury, SY1 1HU
+44(0)1743 298 100
info@geosmartinfo.co.uk
www.geosmartinfo.co.uk

GeoSmart Information

1. Executive summary

A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with the National Planning Policy Framework (NPPF) (2023) and National Planning Practice Guidance (NPPG) (Published in 2014 and updated in August 2022). A site-specific flood risk assessment, to assess the flood risk to and from the development Site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline[1]	After Analysis[2]	After Mitigation[3]
River (fluvial) flooding	Very Low		N/A
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low		Very Low
Groundwater flooding	Negligible		N/A
Other flood risk factors present	No		N/A
Is any other further work recommended?	No (See below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site-specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

Summary of existing and proposed development

The Site was formerly used within a residential capacity as student accommodation with associated access landscaped areas and outbuildings.

Development proposals comprise the change of use of the existing student accommodation to a single family dwelling. Site plans are included within Appendix A.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

Historical flooding related to ordinary watercourse associated with Strawberry Hill Golf Club is understood to have previously occurred at/in the vicinity of the Site.

River (fluvial) and Sea (Estuarine/Coastal) flooding

According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located within a fluvial and tidal Flood Zone 1 (Low Probability).

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a Very Low risk of flooding from Rivers and the Sea.

Surface water (pluvial) flooding

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a Very Low risk of pluvial flooding.

- Flooding would not affect the area proposed for development in the 1 in 100 year plus climate change event.
- A SuDS strategy has been prepared separately (ref: 82632.01) to ensure surface water runoff from the Site is managed over the lifetime of the proposed development.

Groundwater flooding

Groundwater Flood Risk screening data indicates there is a Negligible potential risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event.

Artificial sources of flooding

The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:

- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
- Ordnance Survey (OS) data confirms there are no canals near to the Site.
- The interactive mapping of SFRA (Metis, 2021) has identified 7 incidences or modelled incidences of flooding as a result of surcharging sewers within the vicinity of the site. However, records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site (Thames Water, 2024; Appendix C).

The risk of flooding from artificial sources is considered to be Negligible.

The risk to the development has been assessed over its expected 100 year lifetime, including appropriate allowances for the impacts of climate change which could increase the flood risk to the Site. Risks identified includes increased potential for surface water and appropriate mitigation measures are proposed.

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site.

- The ongoing management and maintenance of existing and any proposed drainage networks, under the riparian ownership of the developer, should be undertaken in perpetuity with the development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction

Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development Site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2023) and the source(s) of any flood risk present, guided by the NPPG (Published in 2014 and updated in August 2022). Finally, a preliminary assessment of the steps that can be taken to manage flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2023) and NPPG (2022).

"*The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied*" (NPPF, 2023).

The NPPF (2023) and NPPG (2022) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"*The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding*" (Paragraph: 023. NPPG, 2022).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2022 (Paragraph: 021 Reference ID: 7-021-20220825), a thorough review of publicly and commercially available flood risk data and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Richmond upon Thames Strategic Flood Risk Assessment (SFRA) (Metis, 2021) are used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2023).

The existing and future flood risk to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation

measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency	Thames Water (Appendix C)	OS Data
Historical	X	X	X		
River (fluvial) / Sea (tidal/coastal)	X	X	X		
Surface water (pluvial)	X	X	X		

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency	Thames Water (Appendix C)	OS Data
Groundwater	X	X			
Sewer		X		X	
Culvert/bridges		X			X
Reservoir		X	X		

*Local guidance and policy, referenced below, has been consulted to determine local flood conditions and requirements for flood mitigation measures.

Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Richmond upon Thames Local Plan (Richmond, 2018)

LP 21 Flood Risk and Sustainable Drainage

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.

Richmond upon Thames Strategic Flood Risk Assessment (Metis, 2021):

Policies

5.10 Historic Flooding

The London Borough of Richmond upon Thames has historic flooding information for a number of different flood sources. The EA's 'Historic Flood Map' dataset shows the maximum extent of all individual recorded flood outlines in the borough. TWUL's 'Internal Flood Incidents (No. of incidents by partial postcode)' dataset also provides historic flooding information on flood incidents reported to TWUL. The EA's 'Historic Flood Map' dataset can be viewed as part of the Fluvial and Tidal Flood Risk Web Map, whilst TWUL's 'Reported Flooding Incidents' dataset can be viewed as part of the Groundwater, Sewer and Artificial Flood Risk Web Map. Developers and prospective applicants are advised to review these as part of the planning application process. Developers and applicants are also advised to review the PFRA, LFRMS and SWMP for more information. If there are any queries regarding the records, they are advised to contact Richmond upon Thames' LLFA.

2.4.4 Surface Water Management Plan

As part of the Risk Assessment phase, the SWMP defined Critical Drainage Areas (CDAs) for the London Borough of Richmond upon Thames. CDAs are geographical areas (usually hydrological catchments) where multiple and cumulative sources of flood risk have the potential of causing flooding in one or more Local Flood Risk Zones. The impact of this potential flooding could affect people, property, and local infrastructure. The SWMP identified seven CDAs in the Borough:

CDA 001: Twickenham

CDA 002: St Margarets

CDA 003: Strawberry Hill

CDA 004: Richmond and Mortlake

CDA 005: Petersham

CDA 006: Teddington

CDA 007: Hampton Wick

Where a site-specific FRA is required, predicted flood depths should be analysed and appropriately mitigated. Mitigation may include (but not be limited to) flood resistance measures (where predicted flood depths are less than 0.3m) or flood resilience measures (where predicted flood depths are greater than 0.6m). Predicted flood depths between 0.3m and 0.6m should be analysed on a case-by-case basis to determine if resistance measures are sufficient. Design plans should show floor levels (relative to Ordnance Datum) and predicted flood depths.

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2023).

3. Site analysis

Site information

The Site is located in Twickenham in a setting of residential land use at National Grid Reference TQ 15591 72272.

Figure 1. Aerial imagery of the Site (Bluesky, 2024)

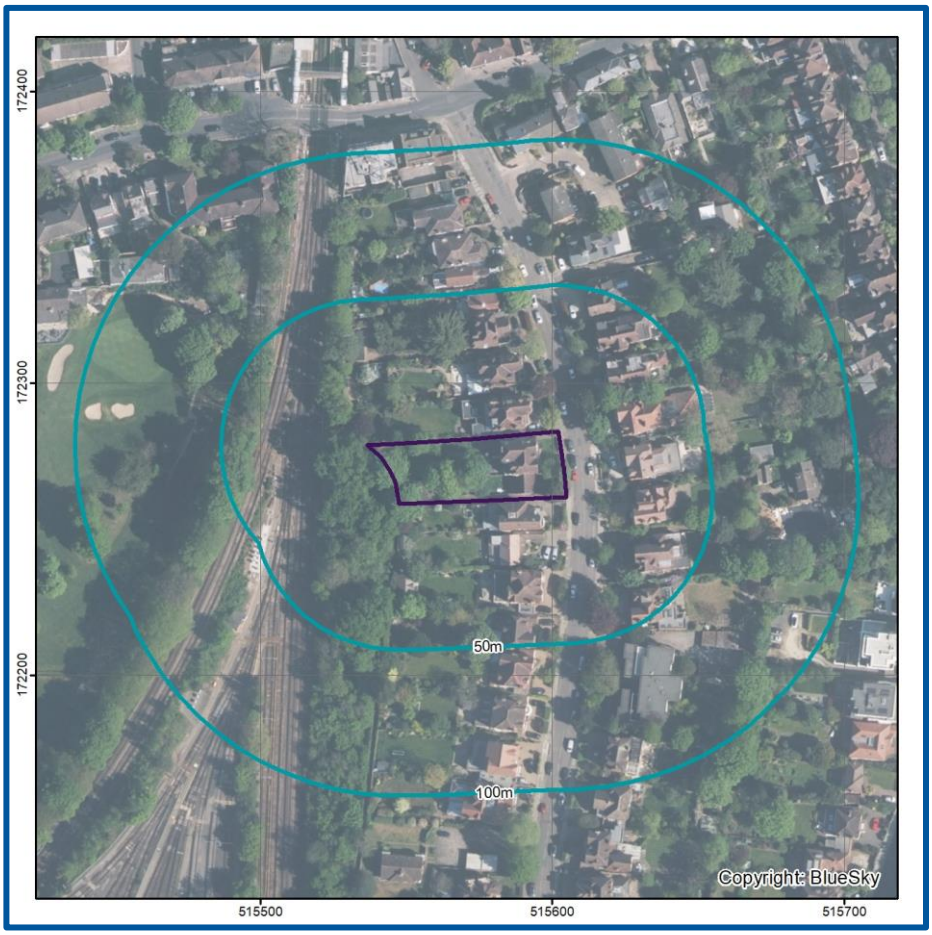
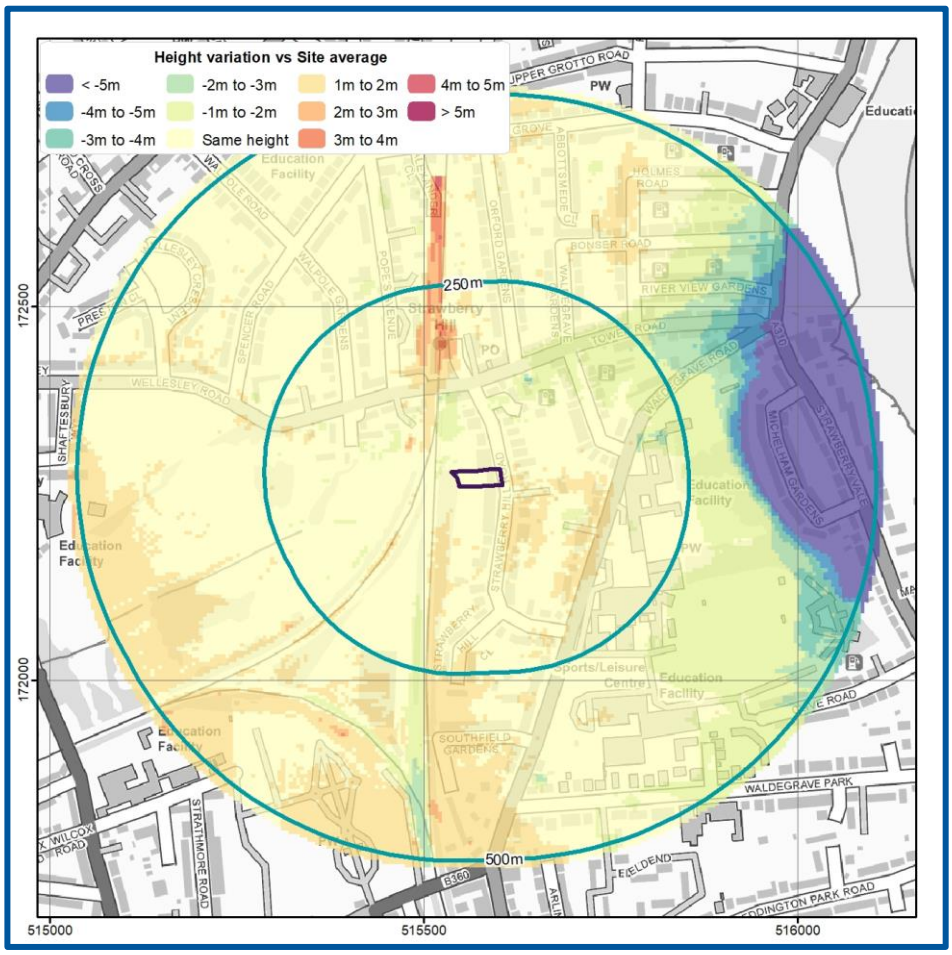


Figure 2 (overleaf) below indicates ground levels within 500m of the Site fall in an easterly direction.

The general ground levels on the Site are between 10.28 and 11.30 mAOD with the centre of the Site being the lowest area. The Site rises gradually towards the eastern and western boundaries. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±0.15 m (Appendix C).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2024)



Development

The Site was formerly used within a residential capacity as student accommodation with associated access landscaped areas and outbuildings.

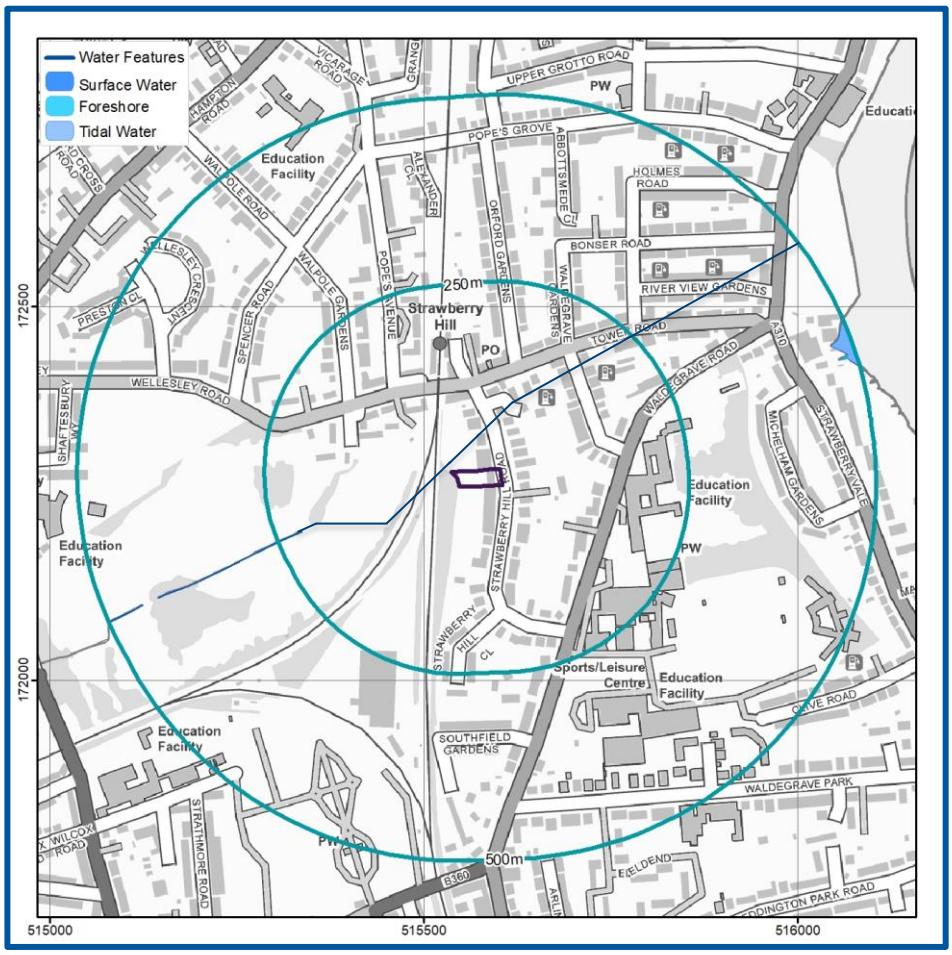
Development proposals comprise the change of use of the existing student accommodation to a single family dwelling. Site plans are included within Appendix A.

The effect of the overall development will result in a decrease in number of occupants and/or users of the building but will not result in the change of use, nature or times of occupation. According to Annex 3 of the NPPG (2022), the vulnerability classification of the existing development is More Vulnerable and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

According to Ordnance Survey (OS) mapping (Figure 3), there are numerous surface water features within 500 m of the Site.

Figure 3. Surface water features (EA, 2024)



There is a small, unnamed watercourse associated with Strawberry Hill Golf Club located approximately 5m northwest of the Site (Figure 3). The watercourse becomes culverted shortly after leaving the golf club before it then discharges into the River Thames.

The River Thames is located approximately 490 m northeast of the Site.

Proximity to relevant infrastructure

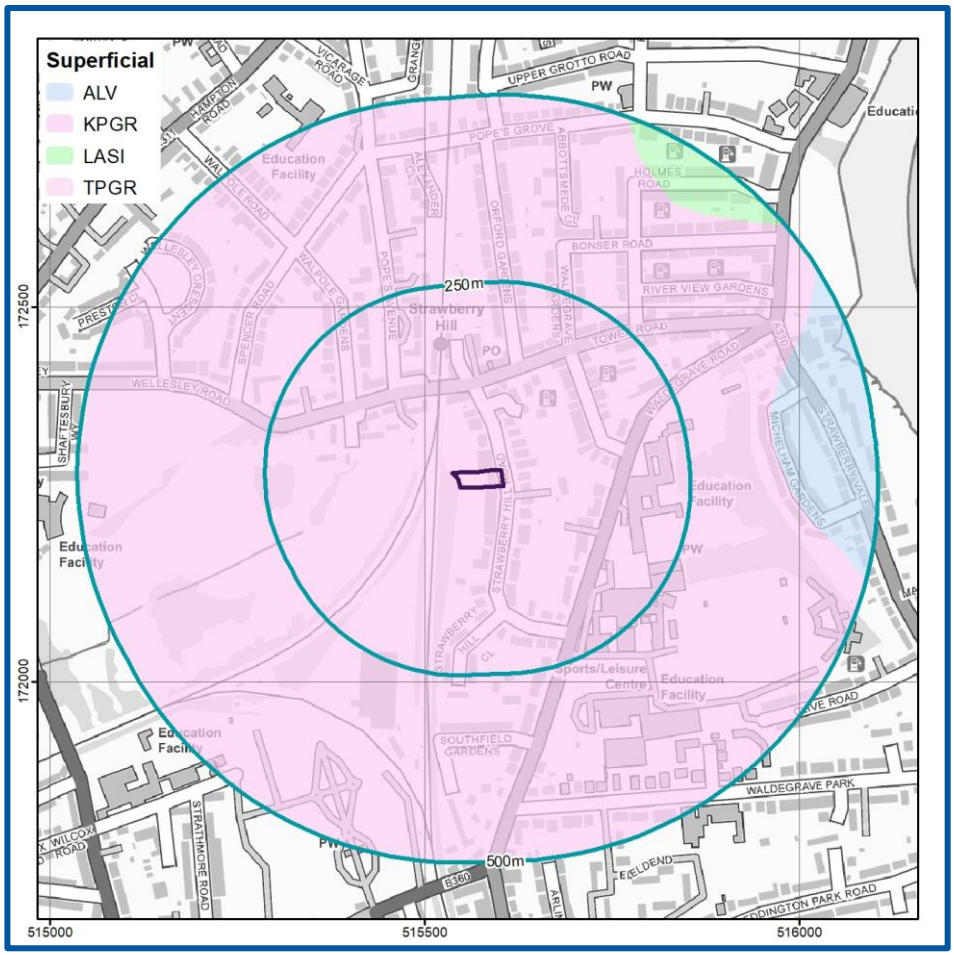
Infrastructure has been identified within 500 m of the Site which could influence the risks of flooding to existing or future occupants. This includes:

- There is a railway line approximately 20m west of the Site.
- Based on the SFRA interactive mapping (Metis, 2021) it is understood that there is a culverted watercourse, flowing beneath the railway line that, at its closest point, is approximately 10m north of the Site.

Hydrogeological features

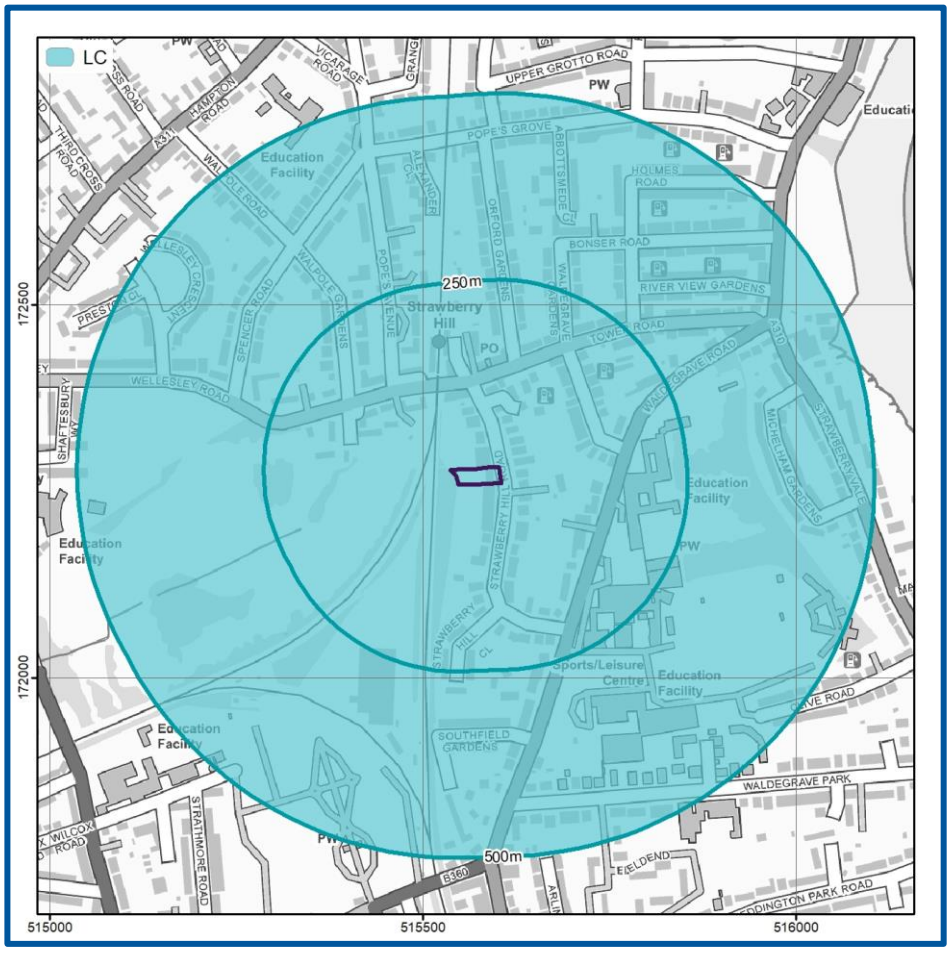
British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 4) consists of the Kempton Park Gravel Member- sand and gravel (KPGR) (BGS, 2024) and is classified as a Principal Aquifer (EA, 2024).

Figure 4. Superficial Geology (BGS, 2024)



BGS mapping indicates the underlying bedrock geology (Figure 5) consists of the London Clay Formation (LC) (BGS, 2024) and is classified as a Unproductive Strata (EA, 2024).

Figure 5. Bedrock Geology (BGS, 2024)



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Geological conditions

A review of the BGS borehole database (BGS, 2024) indicates there are no relevant boreholes within the vicinity of the Site from which the mapped geology or likely depth to groundwater can be confirmed."

Groundwater

Groundwater levels are recorded at 3.5 m below ground level on 16/03/1984, subject to seasonal variations and distance from the site.

4. Flood risk to the development

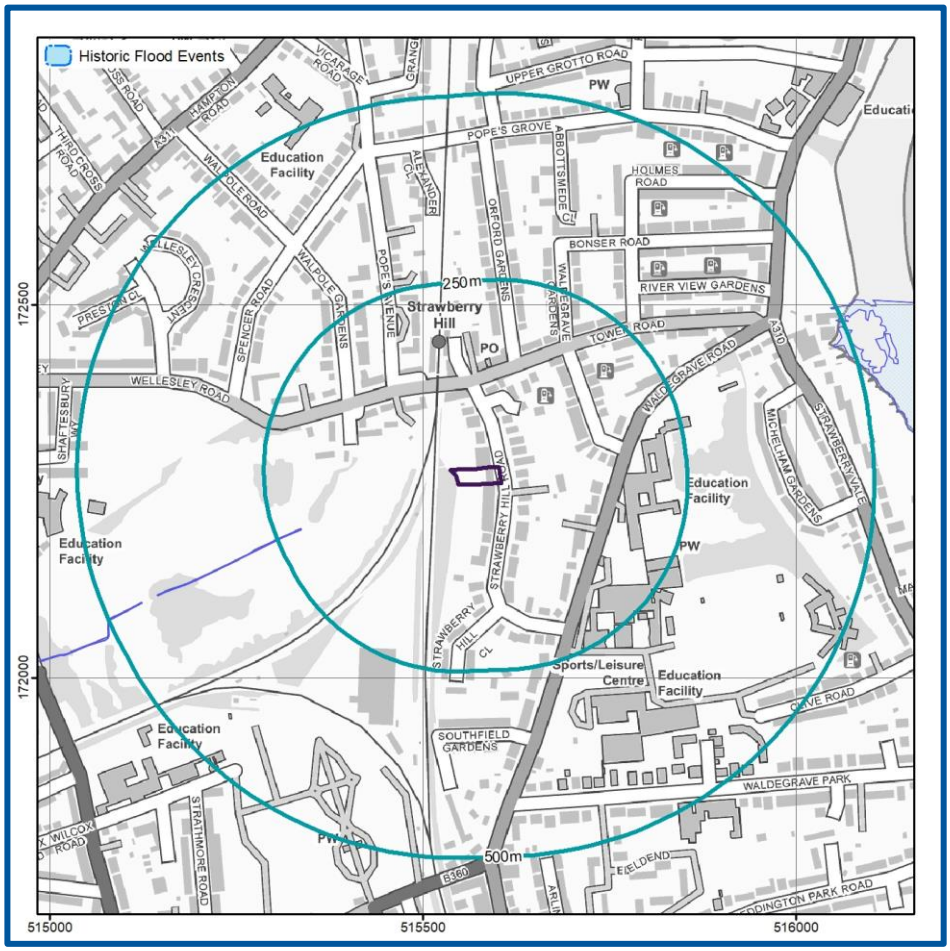
Historical flood events

According to the EA's Historical Flood Map (Figure below) and the interactive online mapping the Richmond upon Thames SFRA (2020), there has been no flooding events affecting the Site. However, a flood event has been recorded within close proximity of the Site.

- In 2013, flooding was recorded in an ordinary watercourse 220m west of the site. Channel capacity was exceeded and no raised flood defences were in place.

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

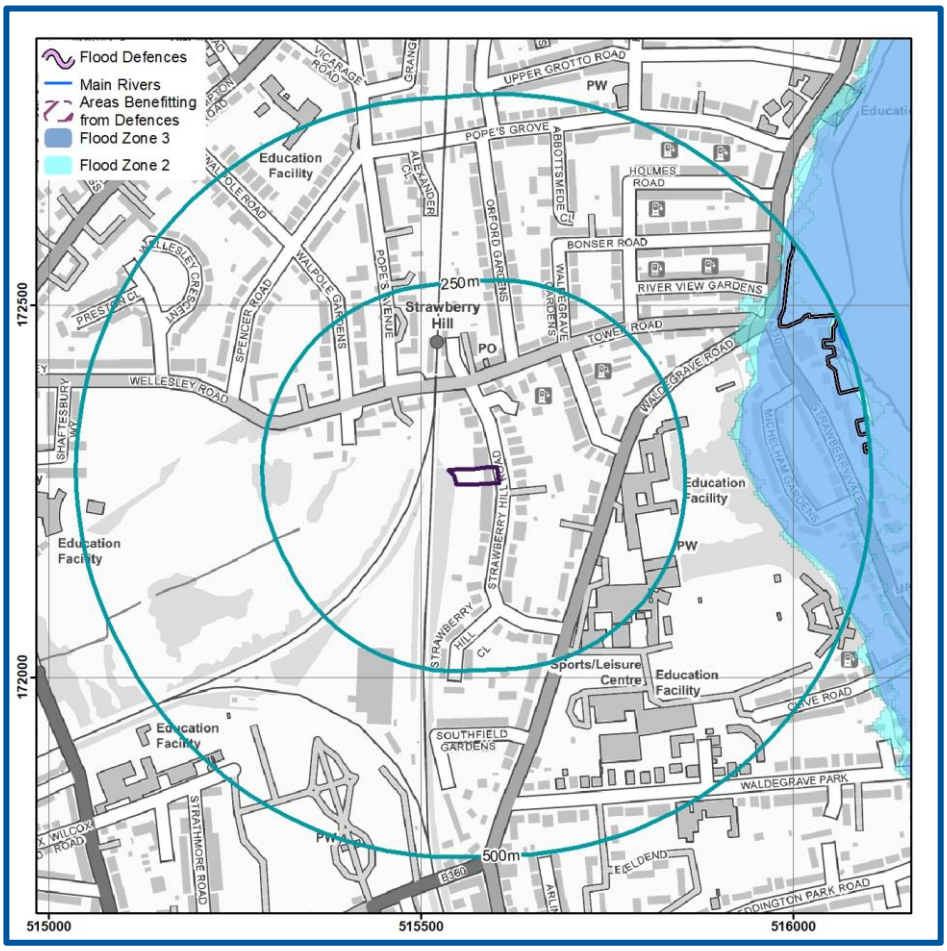
Figure 6. EA Historic Flood Map (EA, 2024)



Rivers (fluvial) / Sea (coastal) / Estuarine (tidal) flooding

According to the EA's Flood Map for Planning Purposes (Figure 7), the Site is located within fluvial and tidal Flood Zone 1 and is therefore classified as having a Low probability of fluvial and tidal (coastal) flooding.

Figure 7. EA Flood Map for Planning Purposes (EA, 2024)



Guidance

As defined in the NPPF (2023):

Ignoring the presence of any defences, land located in a Flood Zone 1 is considered to have a Low probability of flooding, with less than a 1 in 1000 annual probability of fluvial or coastal flooding in any one year.

Development of all uses of land is appropriate in this zone (see glossary for terminology).

There are formal flood defences within 500 m of the Site. Information from the EA relating to the flood defence is outlined below:

- A flood wall is located along the western bank of the River Thames 494 m to the east of the Site (Asset ID: 17199) with a minimum crest height of 6.10 mAOD, design standard of protection of 1 in 1000 years. The condition grade was not provided at the time of writing.

Flood risk including the benefit of defences

The type and condition of existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map (Figure 8), which considers the type, condition and crest height of flood defences, the flood risk from Rivers and the Sea is Very Low.

Figure 8. Risk of Flooding from Rivers and Sea map (EA, 2024)

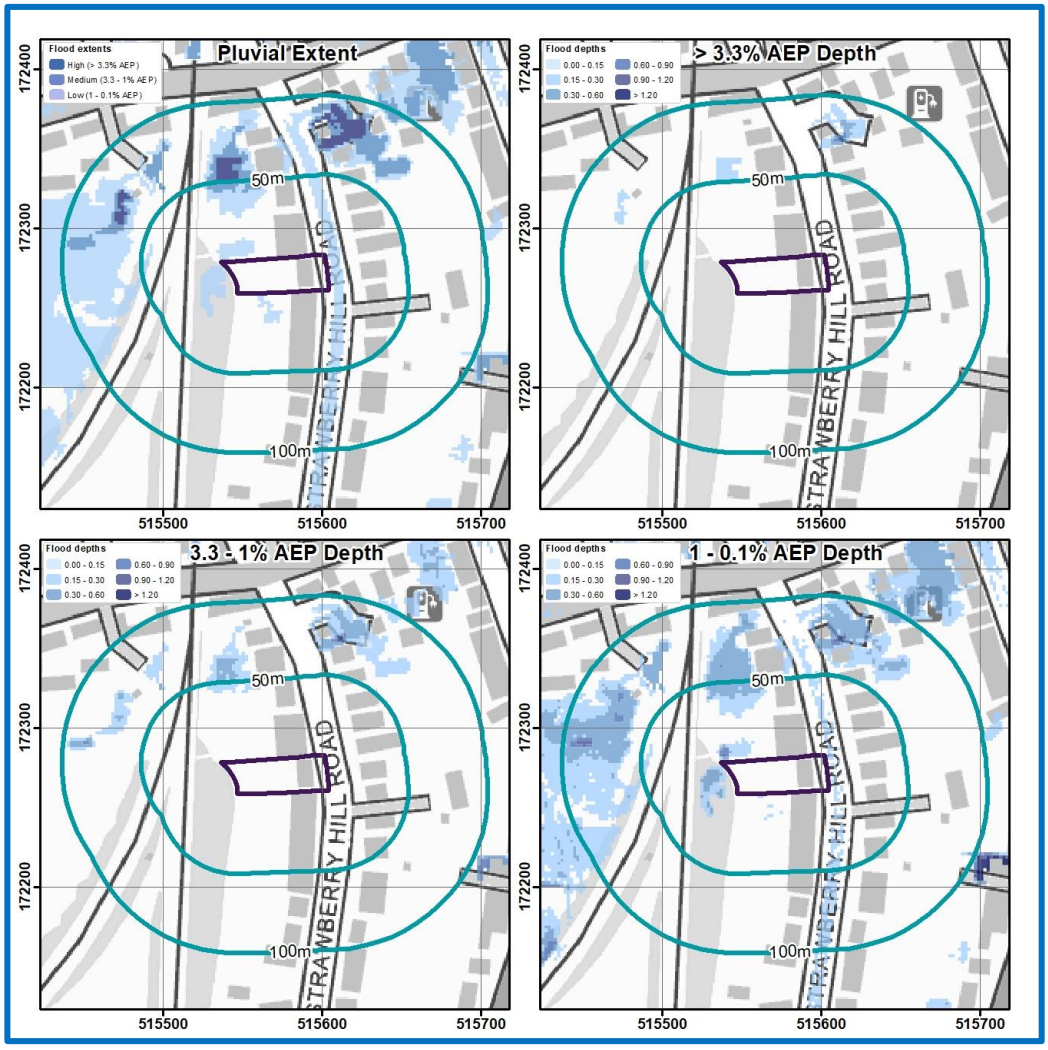
Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping (Figure below), the Site has a Very Low risk of pluvial flooding[1].

In the Low risk scenario, some shallow flooding is modelled within close proximity to the north west and western boundary of the Site.

Figure 9. EA surface water flood extent and depth map (EA, 2024)



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[1] Environment Agency. April 2019. What is the Risk of Flooding from Surface Water map? Version 2.0. Accessed from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/842485/What-is-the-Risk-of-Flooding-from-Surface-Water-Map.pdf

Guidance

According to EA's surface water flood risk map the Site is at:

- Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).

Figure 9 confirms the extent and depth of flooding in multiple modelled flood scenarios identifying that the site remains flood free within a 1 in 1000 year scenario.

Flooding depths of up to 0.6 m are mapped adjacent to the Site, but these are likely to be contained within the landscaped areas adjacent to the western boundary of the site or the adjacent highway.

The SFRA does not indicate reported incidents of historical surface water flooding within 100 m of the Site and confirms the Site is located within Strawberry Hill Critical Drainage Area (CDA)[2] (Metis, 2021).

Climate change factors

Paragraph 002 of the National Planning Practice Guidance (August, 2022) requires consideration of the 1% AP (1 in 100 year) event, including an appropriate allowance for climate change.

As the Site is located within the London Management Catchment and the proposed development is classed as More Vulnerable, where the proposed lifespan is approximately 100 years, the Upper End (40%) allowance is required to determine a suitable climate change factor to apply to rainfall data.

The 0.1% AP (1 in 1000 year) surface water flooding event has been used as a proxy in this instance for the 1% AP (1 in 100 year) plus climate change event where there is no flooding.

Surface water flooding flow routes

Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000 year (Low probability) event confirms the Site is not located on a potential overland flow route.

[2] A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2023). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 10) indicates there is a Negligible risk of groundwater flooding at surface in the vicinity from permeable superficial deposits during a 1 in 100 year event.

Figure 10. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2024)

Mapped classes within the screening map combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding

would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including BGS borehole data, and the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

- It is understood there are no existing basements and a basement is not proposed as part of the development. The risks are higher for basements, buried infrastructure and soakaway systems which may be affected by high groundwater levels.
- According to a review of the hydrogeology (Section 3), the Site is underlain by permeable superficial deposits above low permeability bedrock. A shallow groundwater table could potentially exist above the contact between the superficial and bedrock layers, resulting in a 'perched' groundwater table. Groundwater levels may rise in the superficial aquifer in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.
- Despite the presence of an aquifer the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.
- According to a review of the hydrogeology (Section 3), there are no relevant boreholes within the vicinity of the Site.
- The interactive map of the SFRA does not indicate reported incidents of historical ground water flooding within 50 m of the Site (Metis, 2021). However, it does note that between 50 – 74.9% of the surrounding vicinity is susceptible to groundwater flooding. The mapping also indicates the Site is not considered to be at increased potential for elevated groundwater according to GLA Drain London
- Spring lines have not been identified in close proximity to the Site.

The hydrogeological characteristics suggest there is potential for a groundwater table beneath the Site.

Guidance
Negligible Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. The impact of climate change on groundwater levels beneath the Site is linked to the variation in rainfall recharge which is uncertain.

- Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flooding

The interactive mapping of SFRA has identified 7 incidences or modelled incidences of flooding as a result of surcharging sewers within the vicinity of the site. However, it is recognised that this covers a large area and instances of flooding are not specific to the Site (Metis, 2021).

Records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site (Thames Water, 2024; Appendix C).

Guidance

Properties classified as "at risk" are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier, Thames Water.

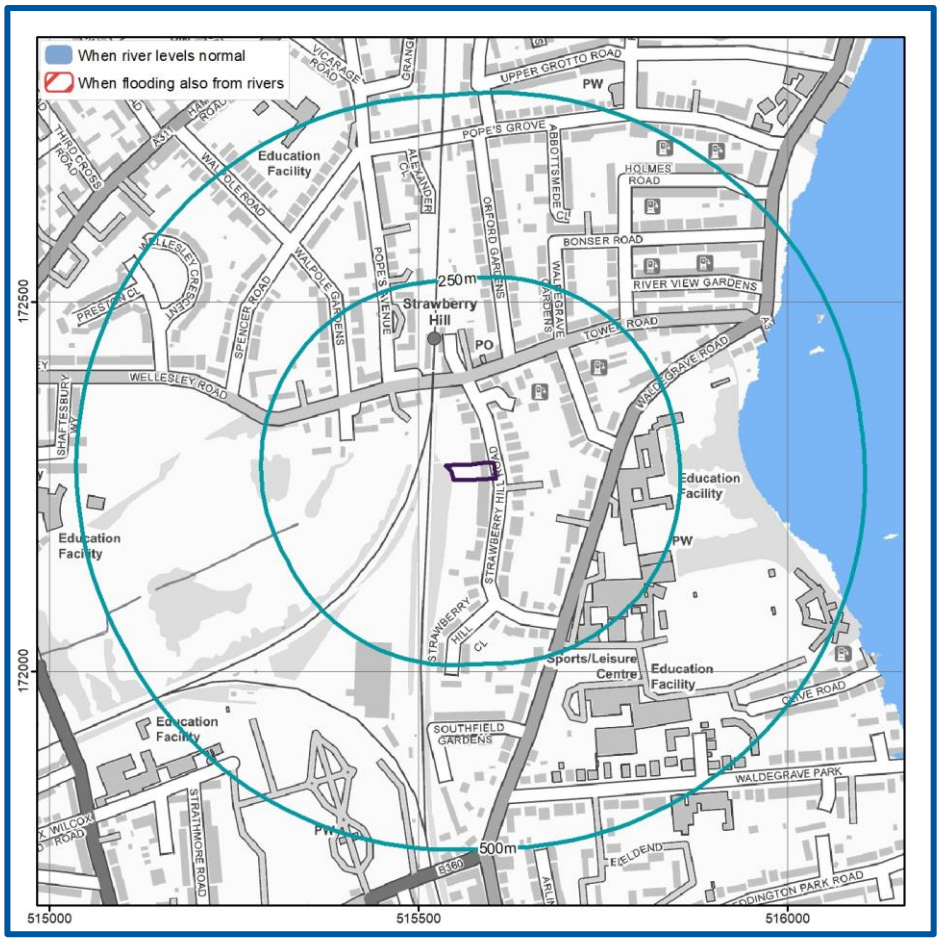
Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure. Culverts have been identified within 50 m of the Site however given the distance of the inlet and outlet from the Site, the risk in the event of blockage is not deemed likely.

Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 11) (EA, 2024).

Figure 11. EA Risk of Reservoir Flooding (EA, 2024)



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5. Flood risk from the development

Floodplain storage

Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.

The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

The Site is not affected from any source of flooding up to and including a 1 in 100-year event with an allowance for climate change. Hence, floodplain storage is not required.

Drainage and run-off

Based on the topography and low surface water flood risk in the vicinity, interference or interaction with overland flow paths and inflows from off-Site is considered unlikely.

The proposed development involves an increase of impermeable surfaces at the Site. An estimation of run-off is therefore required to permit effective Site water management and prevent any increase in flood risk to off-Site receptors from the Site.

A Sustainable Drainage Strategy has been prepared separately by GeoSmart (ref: 82632.01) to manage the increased in runoff from the Site.

6. Suitability of the proposed development

The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance

Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2023). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered.

Exception test: In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within the table overleaf (Table 2 of the NPPG (2022)).

As the Site is located within Flood Zone 1, all types of development listed within the Table overleaf are acceptable according to National Policy.

Table 2. Flood risk vulnerability and flood zone 'incompatibility' (taken from NPPG, 2022)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a - high probability	Exception test required	✓	X	Exception test required	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

7. Resilience and mitigation

Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from sea (coastal/tidal) sources, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

As the Site is not identified as being at risk of flooding from fluvial sources, mitigation measures are not required.

Surface water (pluvial) flood mitigation measures

As the Site is not identified as being at risk of pluvial flooding, mitigation measures are not required.

A surface water drainage (SuDS) strategy has been prepared separately (ref: 82632.01) to ensure surface water runoff can be managed effectively over the lifetime of the proposed development.

In addition, the regular maintenance of any drains and culverts surrounding/on the Site should be undertaken to maintain the Very Low flood risk.

Groundwater flood mitigation measures

As the Site is not identified as being at risk of groundwater flooding, mitigation measures are not required.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its

lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

8. Conclusions and recommendations

Table 3. Risk ratings following Site analysis

Source of Flood Risk	Baseline[1]	After Analysis[2]	After Mitigation[3]
River (fluvial) flooding	Very Low		N/A
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low		Very Low
Groundwater flooding	Negligible		N/A
Other flood risk factors present	No		N/A
Is any other further work recommended?	No (See below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site-specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

More vulnerable developments in a Flood Zone 1 are acceptable according to the NPPF and providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 4. Summary of responses to key questions in the report

Key sources of flood risks identified	None (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	N/A (see Section 7).
Is any further work recommended?	No (See exec summary and section 7)

9. Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

10. References and glossary

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GeoSmart Information

Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is ±0.25m for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council

SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

NPPF (2023) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
Sequential test	Aims to steer new development to areas with the lowest probability of flooding.
Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.

Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2024 BlueSky copyright and database rights 2024
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
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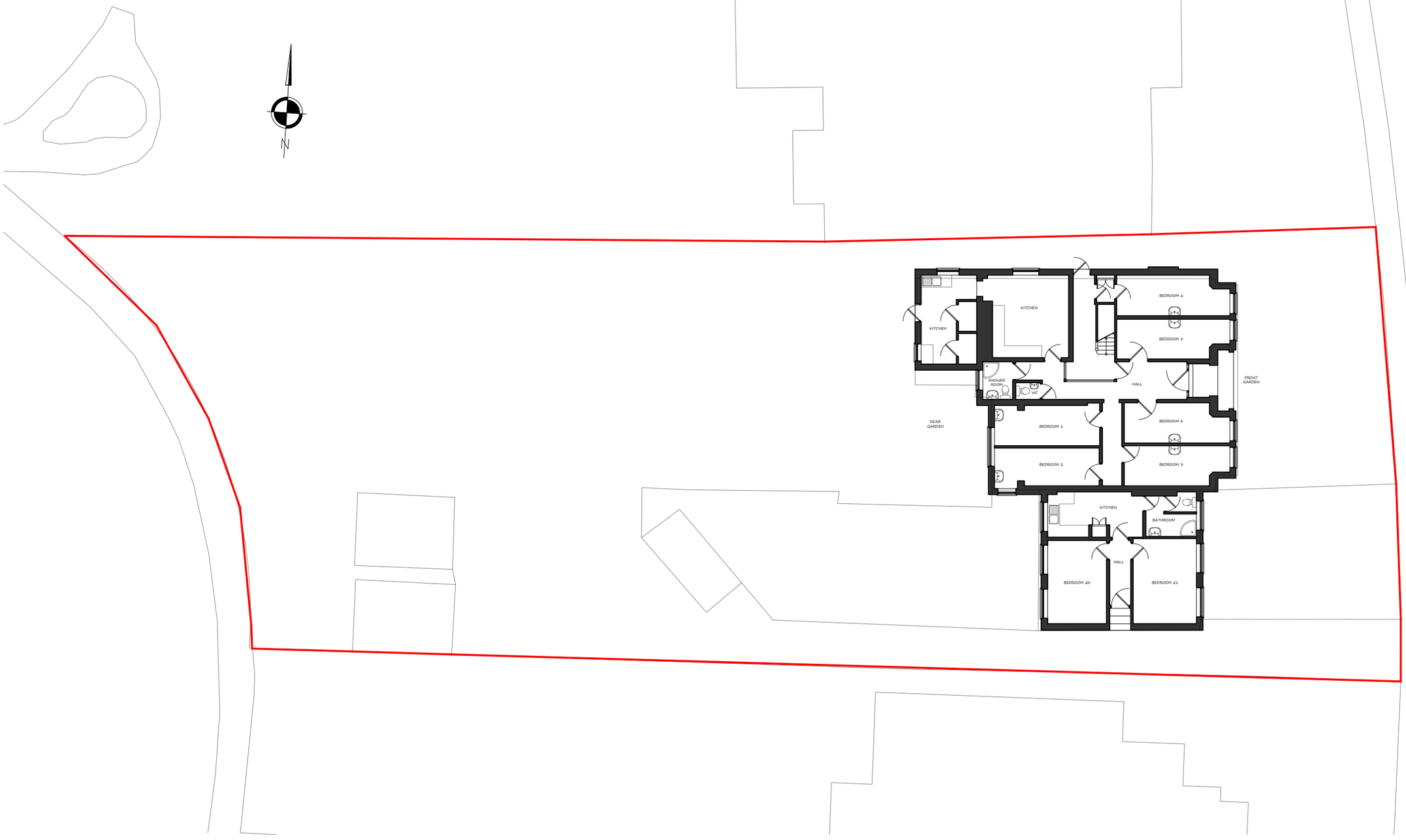
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2024) Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2024
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2024 Environment Agency copyright and database rights 2024

11. Appendices

GeoSmart Information

Appendix A

Site plans



EXISTING BLOCK PLAN 1:200

1:100

2m 0 2m 4m 6m

mza planning
planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **EXISTING BLOCK PLAN**

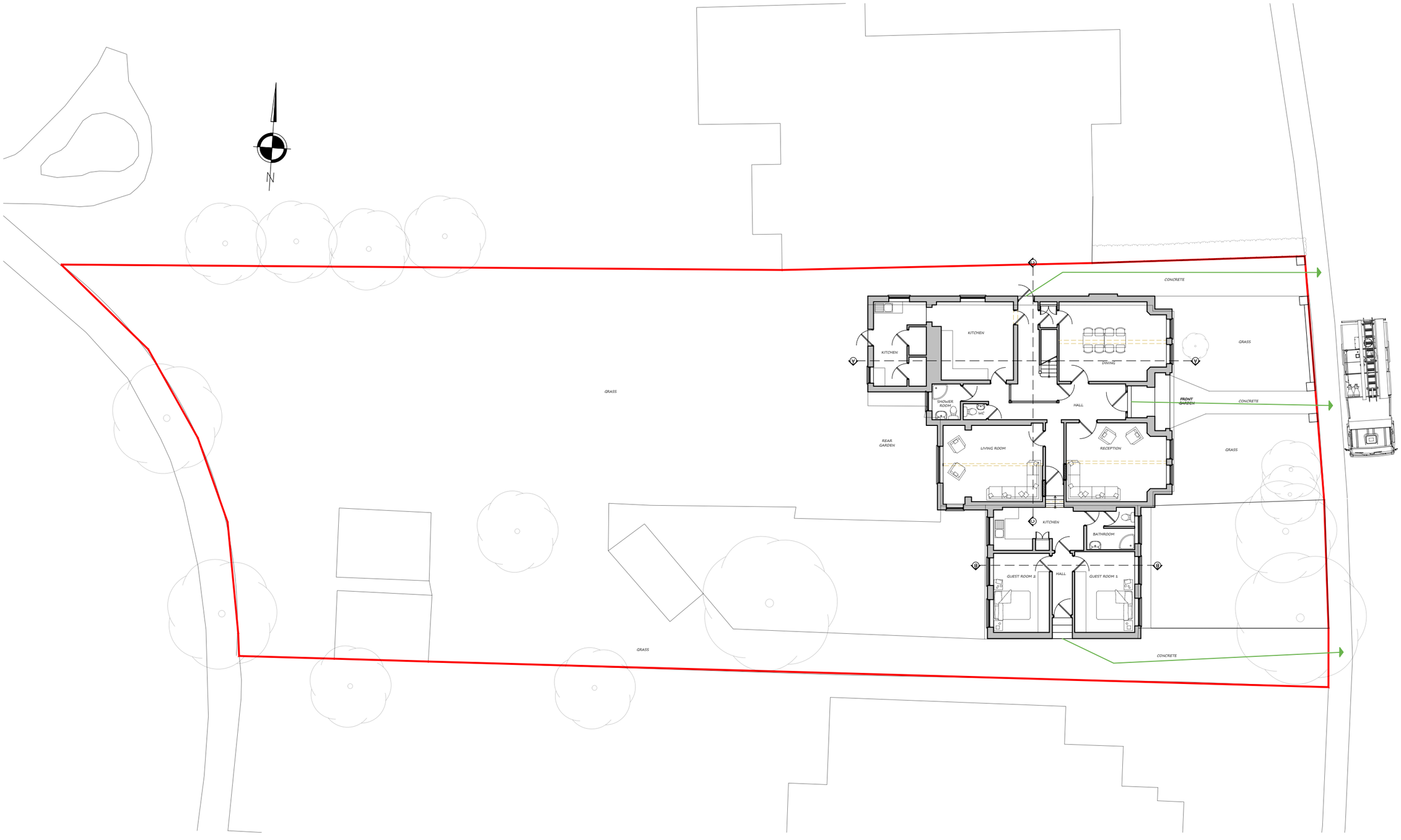
Dwg.No: 591-EXT-06

REV : ORIGINAL

Project: 16 Strawberry Hill Road
Twickenham
TW1 4PT

Date: 27-06-24

Scale: as noted @ A3



PROPOSED BLOCK PLAN 1:200

1:100

2m 0 2m 4m 6m

mza planning
planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **PROPOSED BLOCK PLAN**

Dwg.No: 591-PROP-15

REV : ORIGINAL

Project: 16 Strawberry Hill Road
Twickenham
TW1 4PT

Date: 27-06-24

Scale: as noted @ A3

PROPOSED FRONT ELEVATION 1:100

PROPOSED REAR ELEVATION 1:100

1:100

2m 0 2m 4m 6m

mza planning

planning permission without the headaches

14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **PROPOSED ELEVATIONS**

Dwg.No: 591-PROP-11

REV : ORIGINAL

Project: 16 Strawberry Hill Road
Twickenham
TW1 4PT

Date: 27-06-24

Scale: as noted @ A3

PROPOSED SIDE ELEVATION 1:100

PROPOSED SIDE ELEVATION 1:100

1:100

2m 0 2m 4m 6m

mza planning

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14 Devonshire Mews
Chiswick
London, W4 2HA

T. 0844 500 5050
office@mzaplanning.com

Title: **PROPOSED ELEVATIONS**

Dwg.No: 591-PROP-12

REV : ORIGINAL

Project: 16 Strawberry Hill Road
Twickenham
TW1 4PT

Date: 27-06-24

Scale: as noted @ A3

GeoSmart Information

Appendix B

Thames Water sewer flooding history

Sewer Flooding
History Enquiry

Property Searches

GeoSmart Information Ltd

Bellstone

Search address supplied	16 Strawberry Hill Road Twickenham TW1 4PT
Your reference	82632
Our reference	SFH/SFH Standard/2024_5021241
Received date	**16 July 2024**
Search date	**16 July 2024**

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

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

0800 009 4540

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: 16,Strawberry Hill Road,Twickenham,TW1 4PT

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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

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

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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

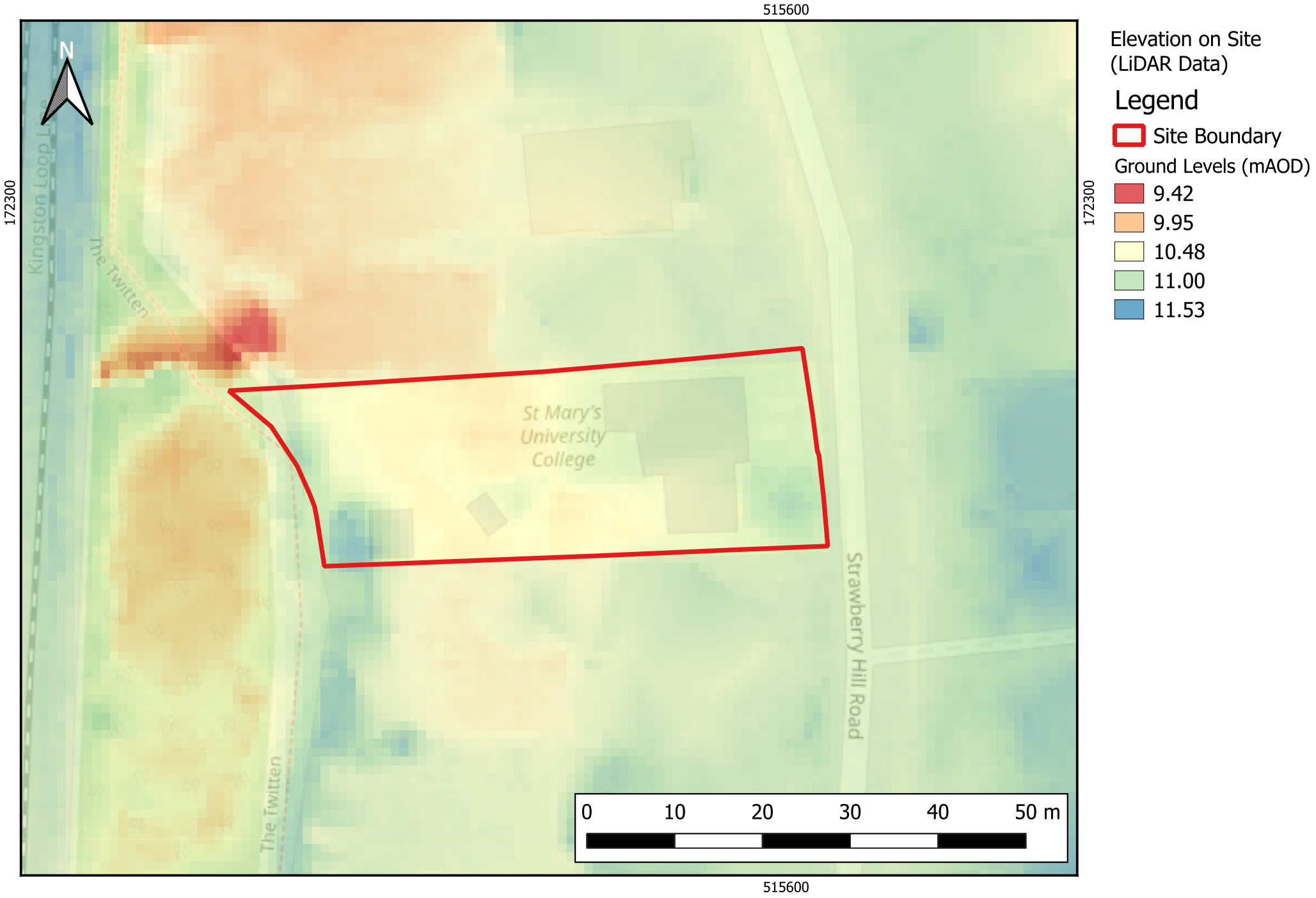
searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

GeoSmart Information

Appendix C

Environment Agency LiDAR ground elevation data


515600
172300
N
Kingston Loop Lane
The Twitten
St Mary's University College
Strawberry Hill Road
The Twitten
0
10
20
30
40
50 m
515600
172300
Elevation on Site (LiDAR Data)
Legend
Site Boundary
Ground Levels (mAOD)
9.42
9.95
10.48
11.00
11.53

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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GeoSmart Information

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The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

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- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

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Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

martinlucass@geosmartinfo.co.uk

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Data use and limitations can be found on our website:

http://geosmartinfo.co.uk/data-limitations/