KNELLER HALL, TWICKENHAM, TW2 7DN

Flood Risk Assessment

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Kneller Hall
4
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Quality Management

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1 INTRODUCTION

1.1 RPS was commissioned to prepare a Flood Risk Assessment (FRA) of *Kneller Hall, Kneller Road, Twickenham, TW2 7DN,* in relation to the proposed re-development of the site.

1.2 The aim of the FRA is to outline the potential for the site to be impacted by flooding, the impacts of the proposed development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk. The report has been produced in accordance with the guidance detailed in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance (PPG). Reference has also been made to the CIRIA SUDS manual (C753), the London Borough of Richmond upon Thames (LBRUT) Strategic Flood Risk Assessment (SFRA) and the LBRUT Surface Water Management Plan (SWMP).

1.3 This report has been prepared in consultation with the Environment Agency (EA) and the Lead Local Flood Authority (LLFA). The site is not located within an Internal Drainage Board (IDB) District.

1.4 The desk study was undertaken by reference to information provided / published by the following bodies:

- Environment Agency (EA);
- British Geological Survey (BGS);
- London Borough of Richmond upon Thames (LBRUT);
- Ordnance Survey (OS); and
- Thames Water (TW).

2 PLANNING POLICY CONTEXT

National Planning Policy

2.1 The National Planning Policy Framework (NPPF) was released in March 2012 and was updated in July 2021. The document advises of the requirements for a site-specific Flood Risk Assessment (FRA) for any of the following cases (Planning and Flood Risk paragraph 167 (footnote 55)):

- All proposals (including minor development and change of use) located within the EA designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
- All proposals of 1 hectare (ha) or greater in an area located in Flood Zone 1 (low probability);
- All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the EA);
- Land identified in a strategic flood risk assessment as being at increased flood risk in future; and
- Where proposed development may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

2.2 Paragraph 169 of the updated NPPF identifies that major developments (developments of 10 homes or more and to major commercial development) should incorporate Sustainable Drainage Systems unless there is clear evidence that this would be inappropriate. The systems used should:

a. *Take account of advice from the Lead Local Flood Authority;*
b. *Have appropriate proposed minimum operational standards;*
c. *Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
d. *Where possible, provide multifunctional benefits.*

2.3 Defra published their 'Non-statutory technical standards for sustainable drainage systems' in March 2015. These are supported by the revised NPPF.

Regional Planning Policy

2.4 The development site is within the London Borough of Richmond upon Thames (LBRUT), which is covered by the London Plan 2021, published in March 2021. The London Plan contains various policies pertaining to flood risk and drainage, the relevant aspects of which are reproduced below.

Policy G1 Green Infrastructure

A. London's network of green and open spaces, and green features in the built environment, should be protected and enhanced. Green infrastructure should be planned, designed and managed in an integrated way to achieve multiple benefits.

B. Boroughs should prepare green infrastructure strategies that identify opportunities for cross-borough collaboration, ensure green infrastructure is optimised and consider green infrastructure in an integrated way as part of a network consistent with Part A.

C. Development Plans and area-based strategies should use evidence, including green infrastructure strategies, to:

1. Identify key green infrastructure assets, their function and their potential function

2. *Identify opportunities for addressing environmental and social challenges through strategic green infrastructure interventions.*

D. *Development proposals should incorporate appropriate elements of green infrastructure that are integrated into London's wider green infrastructure network.*

Policy G5 Urban Greening

A. *Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.*

B. *Boroughs should develop an Urban Greening Factor (UGF) to identify the appropriate amount of urban greening required in new developments. The UGF should be based on the factors set out in Table 8.2, but tailored to local circumstances. In the interim, the Mayor recommends a target score of 0.4 for developments that are predominately residential, and a target score of 0.3 for predominately commercial development (excluding B2 and B8 uses).*

C. *Existing green cover retained on site should count towards developments meeting the interim target scores set out in (B) based on the factors set out in Table 8.2.*

Policy SI12 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.*

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 co-operate 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 SI13 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 runoff 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, improve water quality, and enhance biodiversity, urban greening, amenity and recreation.*

Local Planning Policy

2.5 The LBRUT Local Plan was adopted in July 2018 and contains the following Policies relating to flood risk and drainage:

*"**Policy LP 17 Green Roofs and Walls***

Green roofs and/or brown roofs should be incorporated into new major developments with roof plate areas of 100sqm or more where technically feasible and subject to considerations of visual impact. The aim should be to use at least 70% of any potential roof plate area as a green / brown roof.

The onus is on an applicant to provide evidence and justification if a green roof cannot be incorporated. The Council will expect a green wall to be incorporated, where appropriate, if it has been demonstrated that a green / brown roof is not feasible.

The use of green / brown roofs and green walls is encouraged and supported in smaller developments, renovations, conversions and extensions."

*"**Policy LP 20 Climate Change Adaption***

A. The Council will promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.

[…] C. Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported."

"Policy LP 21 Flood Risk and Sustainable 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 3b (Functional Floodplain)	*Basements, basement extensions, conversions of basements to a higher vulnerability classification or self-contained units will not be permitted.*
Flood Zone 3a (Tidal / Fluvial)	*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:* - *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.*
Flood Zone 2	*In areas of Extreme, Significant and Moderate 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 maybe 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.*
Flood Zone 1	*No restrictions on new or extensions to existing basements.*

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."

2.6 The LBRUT SFRA identifies and maps flood risk from all sources at a borough-wide scale as well as providing guidance on producing site specific FRAs. Relevant information from the SFRA has been referenced throughout this FRA report.

2.7 The LBRUT SWMP assesses the risk of surface water flooding within the Borough and identifies options to manage risk to acceptable level. Relevant information from the SWMP has been reproduced throughout this FRA report.

3 CONSULTATION

Environment Agency

3.1 The site is located in Flood Zone 1, away from the EA identified floodplain and as such the EA has not been consulted.

Thames Water

3.2 The public sewer in the area of the site is operated and maintained by Thames Water (TW). Preliminary consultation with TW has confirmed that they hold no records of sewer flooding at the site. A response is included as Appendix A.

Lead Local Flood Authority

3.3 LBRUT were consulted in January 2022 regarding the proposed development. The Council's Flood Risk consultant has advised that there are no reports of flooding at or around the immediate location of the site. It was also confirmed that the site is within a Critical Drainage Area - Group 8_001.

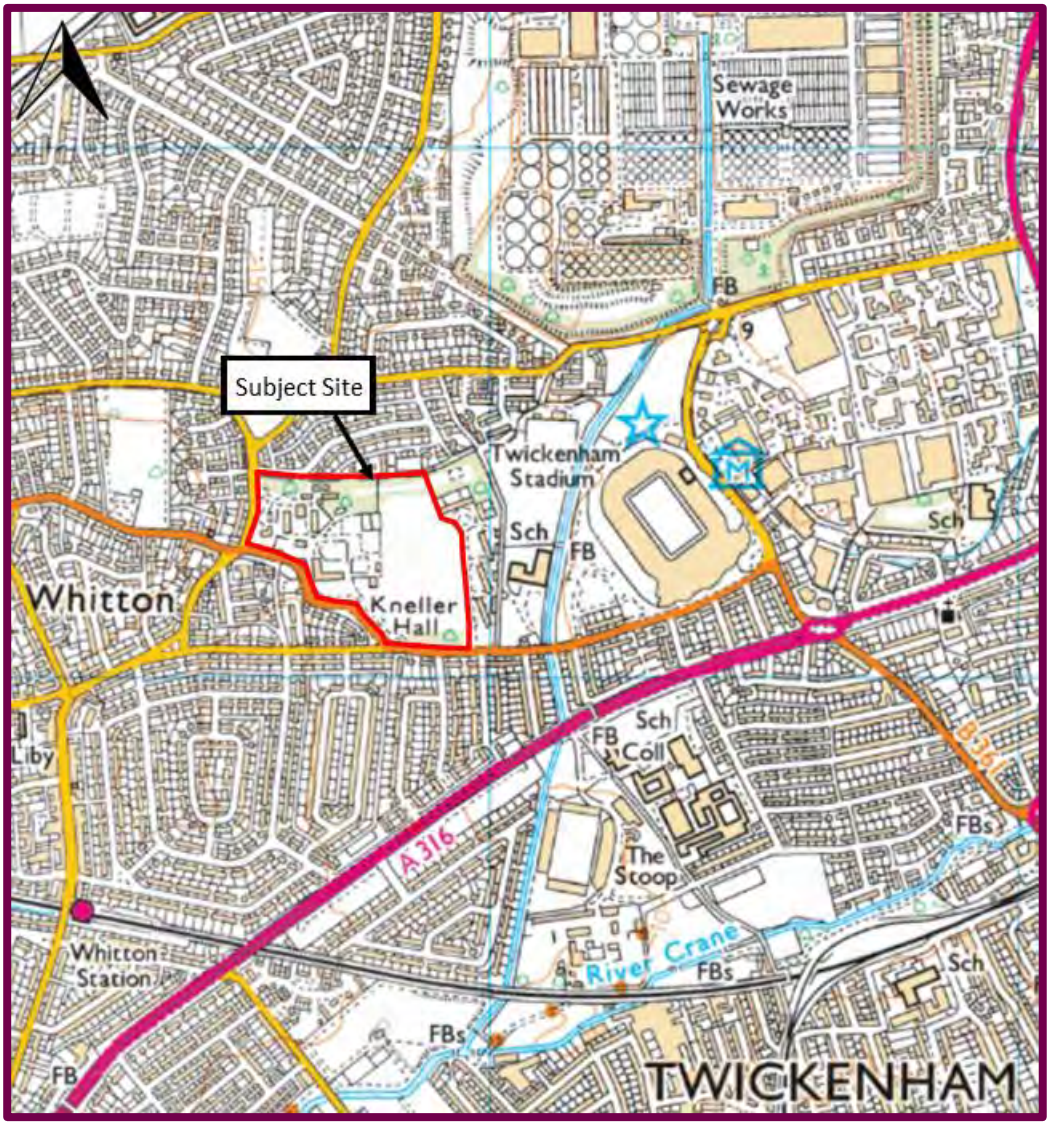
Internal Drainage Board

3.4 The site is not located within an IDB District.

4 SITE DESCRIPTION

Site Description

4.1 The site is centred around National Grid Reference TQ 14782 74245. It is irregular in shape, occupying an area of approximately 9.7 hectares. A site location plan is provided in Figure 1.



Approximate site boundary indicated red, for location purposes only.

Figure 1. Site Location

4.2 The site has been occupied until August 2021 by the military as a base and the home of the Royal Military School of Music. The site comprises Kneller Hall, various ancillary buildings, open space, playing fields and service areas associated with the previous use. The site is surrounded by boundary walls/ railings. The site is categorised into three areas:

- Kneller Hall and its immediate setting;
- A campus style development including 20th century buildings, access routes and car parks; and
- Metropolitan Open Land including private playing fields, informal grassland areas, small buildings, a green corridor and Whitton Brook along the northern boundary.

4.3 The Kneller Hall, the boundary walls and internal garden wall are all Grade II listed. The Guardroom and Band Practice Hall are curtilage Listed Buildings, meaning they are recognised as having value as structures associated with the primary listed building of Kneller Hall.

4.4 The primary vehicular and pedestrian access is currently via the Main Gate on Kneller Road (B361). The secondary access is via the Lodge Gate on Kneller Road.

Surrounding Land Uses

4.5 The site is within a predominately residential area bordered to the north, south and west by residential properties. Kneller Road runs along the southern site boundary.

4.6 Whitton Tennis Club is located to the north of the site.

4.7 Chase Bridge Primary School is located beyond the eastern boundary and Twickenham Stadium is located further east.

4.8 There are no designated sensitive areas (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI)) within close proximity to the site.

Topography

4.9 A topographic survey was conducted by Warner Surveys in January 2021 (ref: LT/220/0504). The site generally appears to slope down towards the southeast with levels ranging from 10.05m AOD in the southeast corner of the site to 12.84m AOD in the northwest corner of the site. There is some variation in the elevation towards the southwest margin of the site, where levels are around 14.30m AOD. Levels on the Kneller Road range from approximately 10.04m AOD to around 13.08m AOD. The topographic survey has been included in Appendix B.

5 PROPOSED DEVELOPMENT

5.1 The proposed development is for the demolition of existing modern buildings on the site and the conversion of Kneller Hall and other ancillary buildings associated with the Royal Military Music School to a day school (use Class F1), together with the construction of associated new purpose-built buildings including teaching space, indoor sports facilities and sporting pavilion, and other ancillary works including landscaping, access and energy centre.

The proposed development comprises the following core elements:

- Use of the main Grade II listed Kneller Hall for Education Use (Use Class F1);
- Use of Guard Room and Band Practice Hall for Education Use (Class F1);
- Demolition of existing modern buildings on the site and the conversion of other existing single storey modern buildings to use as an energy centre and for maintenance storage, ancillary to the main school use (Use Class F1);
- New build development to provide new purpose-built buildings for school use including, teaching space and classrooms, an indoor sports facility with a swimming pool and sporting pavilion (Use Class F1);
- Upgrading and enhancing the existing playing fields and outside sports pitches at the Site;
- Ancillary works to facilitate the use of the Site as a school to include high quality sports facilities and a Forest School programme; and
- Facilitation of managed local school and local community group access to the sports and forest school facilities.

5.2 The Site will be used as a day school for up to 1,000 pupils. The Site will accommodate pupils between the ages of 11-18, equivalent to Year 7 through to Year 13. The Site will not provide boarding or residential accommodation.

5.3 The Planning Practice Guidance (PPG) details the suitability of different land uses within each flood zone. The proposed land use is classified as ‘more vulnerable’ (Non–residential uses for health services, nurseries and educational establishments), and such uses are generally considered compatible with Flood Zone 1.

5.4 Development plans are shown in Appendix C.

6 HYDROLOGICAL SETTING

Nearby Watercourses

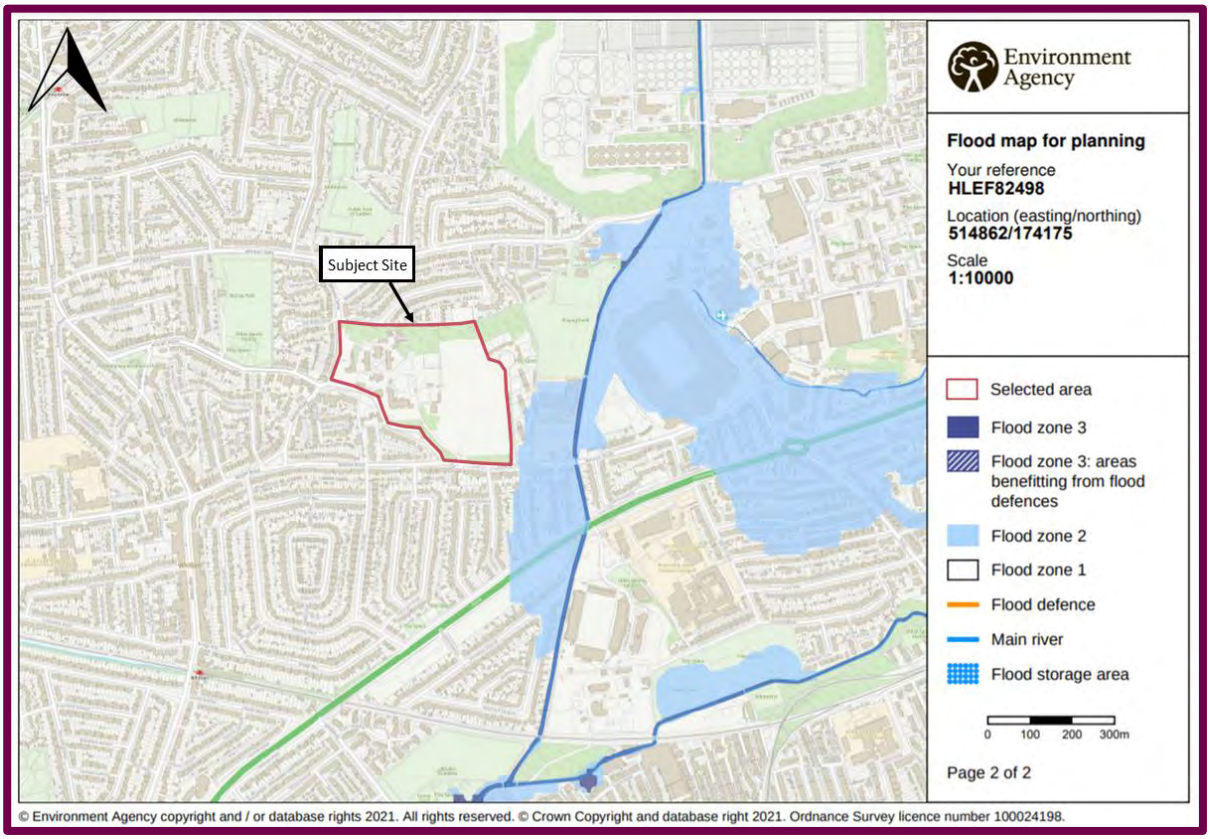
6.1 Reference to OS Mapping indicates that the nearest surface water feature is the Duke of Northumberland's River located approximately 170m east of the site. It flows in a north easterly direction.

6.2 The River Crane is located approximately 800m south of the site.

6.3 No other artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1km of the site.

Fluvial / Tidal Flood Risk Classification

6.4 The EA Flood Map for Planning, available online, indicates that the site is located within Flood Zone 1, which is classified as land having a less than 1 in 1,000 annual probability of flooding from river or sea. The EA Flood Map for Planning is provided in Figure 2.



Approximate site boundary indicated red, for location purposes only.

Figure 2. EA Flood Map for Planning

EA Flood Warning Area

6.5 The EA defines a Flood Warning Area as "*geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater*." The site is not located in a Flood Warning Area.

Surface Water Flood Risk Classification

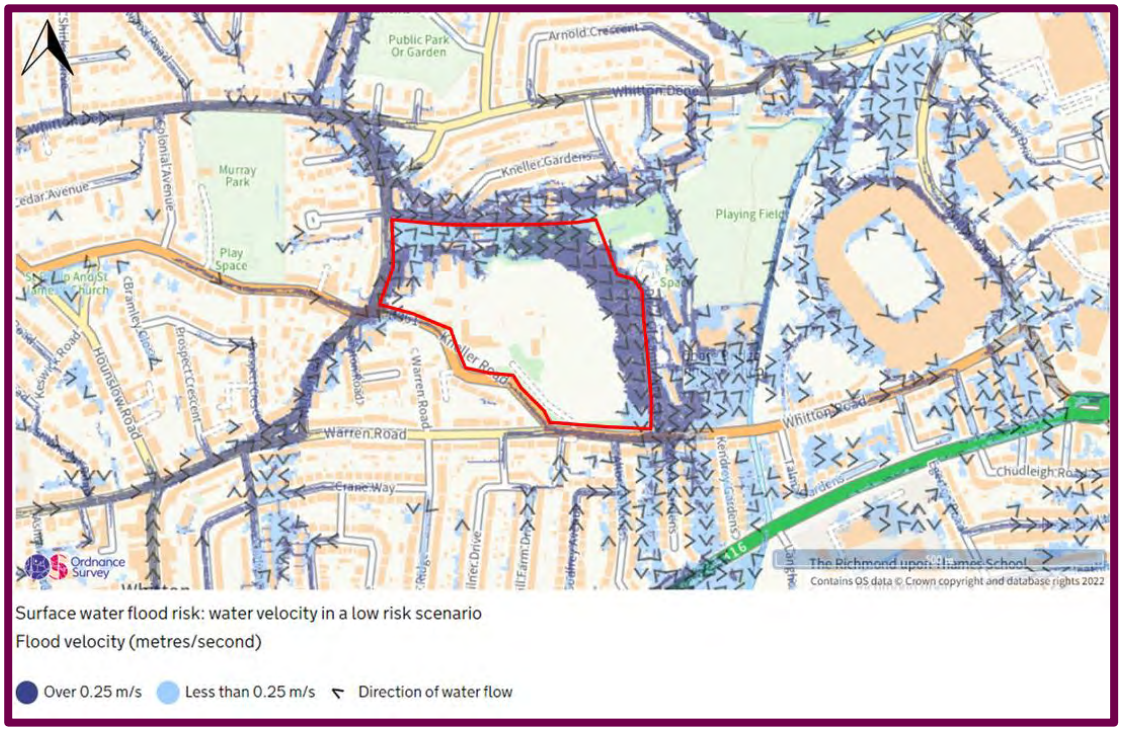
6.6 The EA Flood Map for Surface Water, which is available online, indicates that the site is likely to be affected by surface water flooding. A band of surface water risk is present around the western, northern and eastern boundaries of the site which is primarily 'Low' risk. This corresponds with an annual probability of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%). The map indicates an area within the northwest portion of the site which is at 'Low' to 'High' risk of surface water flooding. A 'High' risk from surface water flooding corresponds with an annual probability of flooding of greater than 1 in 30 (3.3%). The EA Flood Map for Surface Water is presented in Figure 3.

Approximate site boundary indicated red, for location purposes only.

Figure 3. Updated Flood Map for Surface Water

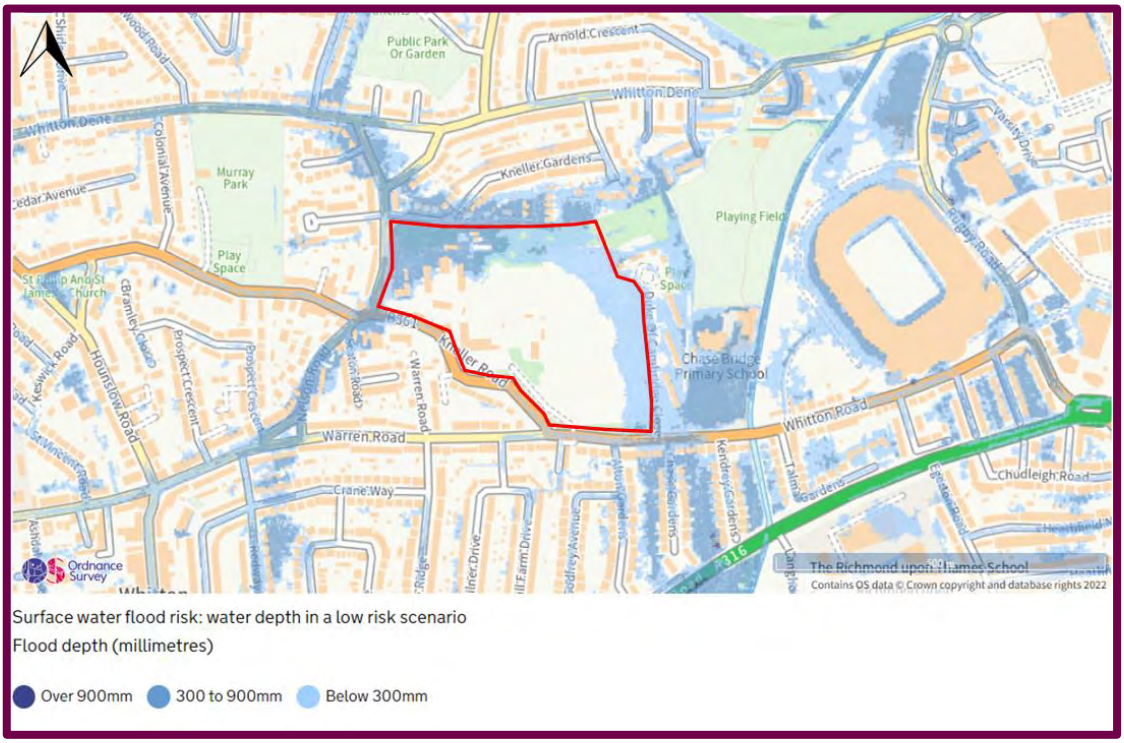
6.7 Figure 4 below indicates that the band of surface water flood risk present around the western, northern and eastern boundaries of the site appears to form a surface water flow path, part of which originates off site. This surface water flows along the margin of the site and appears to make its way towards the Duke of Northumberland's River to the east of the site. The surface water flows at the site are indicated to reach a velocity of over 0.25m/s.

6.8 However, it appears that whilst the flow path is clearly defined along the site boundaries, some of the water between the existing buildings is still and is ponding in lower topographical spots or trapped between the buildings. The map reflects the current set up of the site with the existing buildings at place. It is indicated that during the 1 in 100 year flood event (the medium flood risk), the flood depth of surface water pooling near the buildings is less than 300mm. During the 1 in 1000 year event the predicated flood depth is between 300mm and 600mm. This is illustrated in Figure 5.



Approximate site boundary indicated red, for location purposes only.

Figure 4: Flood Map for Surface Water (Velocity- Low Risk Scenario)



Approximate site boundary indicated red, for location purposes only.

Figure 5: Flood Map for Surface Water (Depth- Low Risk Scenario)

6.9 According to the new masterplan for the site, some of the existing buildings will be retained and some will be demolished and replaced with new buildings.

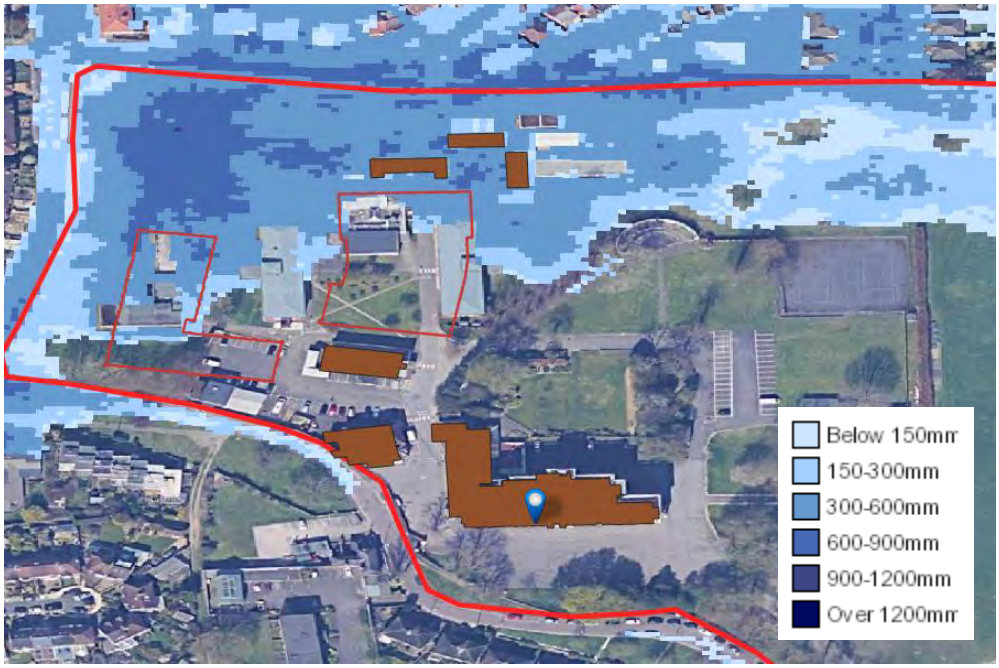
6.10 The three small buildings to the north will remain, with two of the three buildings to be extended. These buildings are entirely within the surface water flood outline. These buildings are to be a plant room, associated with the site's energy strategy and site maintenance equipment. The predicated flood depth in a 1 In 1,000 year event surrounding these structures is between 300mm and 600mm and during the 1 in 100 year event the depth is between 150mm and 300mm.

6.11 When overlapping the Flood map with the proposed masterplan, it could be seen that part of the area of the new buildings and in particular teaching building and the sport centre falls within the surface water flood extent. However, it appears that the building footprint of the new buildings within the flood area is not bigger than the building footprint of the existing buildings in this area. As such, no additional flood volume will be displaced, and no flood compensation would be required.

6.12 Further analysis of low-risk surface water velocity maps show ponding on the outside of the teaching building where low velocity flows meet at less than 0.25m/s, so no flood path has been identified. The predicted flood depth around the north wing of the proposed teaching building is predominantly between 300mm and 600mm. The north boundary of the proposed site for the sports centre construction also has a predicted depth of between 300mm and 600mm. This is illustrated in Figure 6.

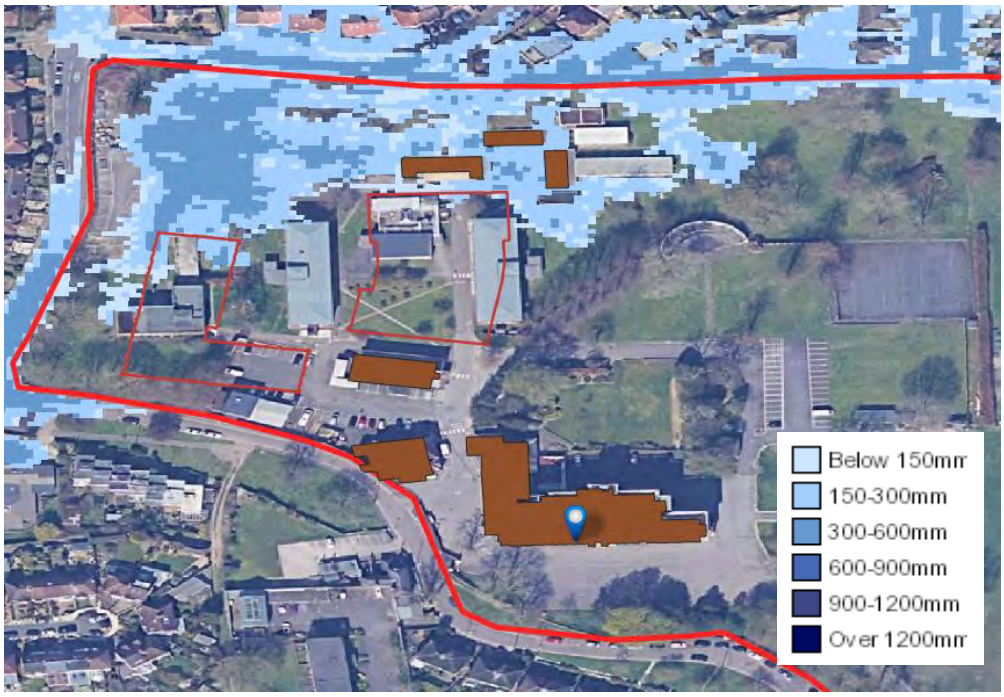
6.13 During the 1 in 100 year event (medium risk), the flood outline is significantly reduced with predicted flood depth along the north boundaries of both buildings of between 150mm and 300mm. This is shown in Figure 6.

6.14 Due to the relatively small, predicted flood depth compared to other areas on site the surface water flood risk around the proposed buildings can be dealt with by the proposed drainage strategy.



https://environment.data.gov.uk/spatialdata/risk-of-flooding-from-surface-water-depth-0-1-percent-annual-chance/wms.

Figure 6: Flood Map for Surface Water (Flood Depth for the 1 in 1000 Scenario)

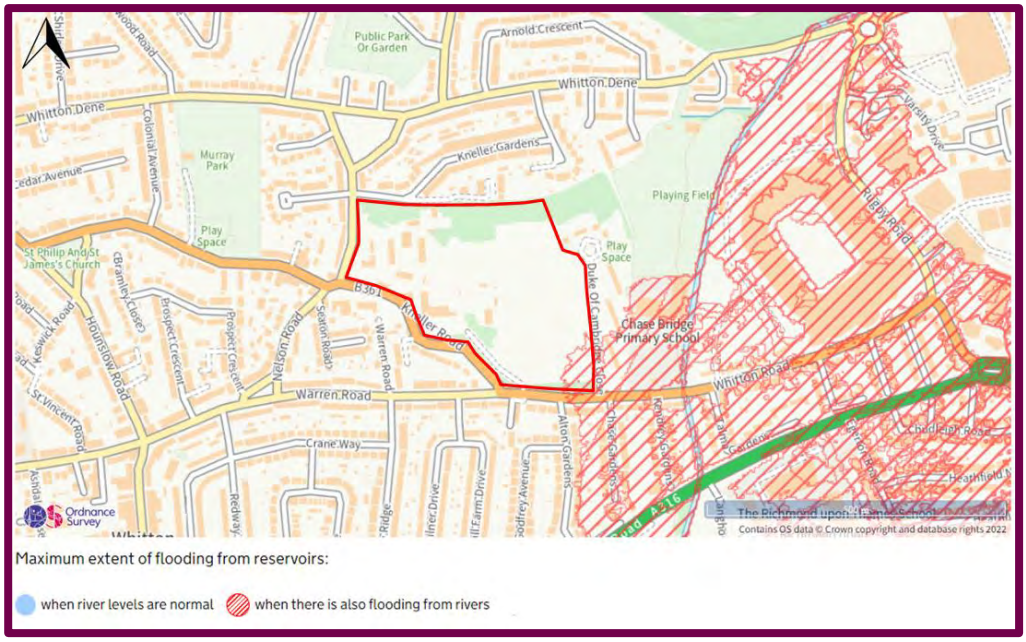


https://environment.data.gov.uk/spatialdata/risk-of-flooding-from-surface-water-depth-0-1-percent-annual-chance/wms.

Figure 7: Flood Map for Surface Water (Flood Depth for the 1 in 100 Scenario)

Reservoir Flood Risk Classification

6.15 The EA's Long-Term Flood Mapping indicates that the majority of the site falls outside of the maximum extent of reservoir flooding. A small area within the south eastern corner of the site falls within the maximum extent of reservoir flooding 'when there is also flooding from rivers'. The EA Flood Risk from Reservoirs Map is provided as Figure 8.



Approximate site boundary indicated red, for location purposes only.

Figure 8: EA Flood Risk from Reservoirs Map

Local Authority Flood Risk Assessment

6.16 The London Borough of Richmond upon Thames SFRA was published in September 2020 with updates in March 2021. The London Borough of Richmond upon Thames SWMP was published in June 2011. Both documents provide an overview of flood risk from various sources within the borough. Information of relevance to this assessment is summarised below:

- The River Thames, River Crane and Beverley Brook flow through the borough and pose a risk of flooding to properties in some areas of the borough.
- The site is located within the Twickenham Critical Drainage Area (CDA Group 8_001). This is an area where multiple and often interlinked sources of flood risk cause flooding on a regular basis.
- The site is shown to be at risk from Surface Water Flooding from a ‘1 in 30’ event, ‘1 in 100’ event and a ‘1 in 1000’ event.
- The site is indicated to be located in an ‘Area Susceptible to Groundwater Flooding’ whereby there is potential for groundwater flooding to occur at the surface and there is a ‘less than or equal to 75%’ chance of groundwater flooding.
- The SFRA mapping indicates that Thames Water records of sewer flooding show 1 outdoor incident has occurred in the vicinity of the site.

7 HYDROGEOLOGICAL SETTING

7.1 Reference to the BGS online mapping (1:50,000 scale) indicates that the eastern portion of the site is underlain by Kempton Park Gravel comprising sand and gravel. The western portion of the site is underlain by both the Taplow Gravel Member, comprising sand and gravel, and Head deposits, comprising clay, silt, sand and gravel. This overlies bedrock of the London Clay Formation.

7.2 Several BGS boreholes are located in the vicinity of the site. Boreholes record ref: TQ17SW118 and Q17SW119 indicates that the following geology was encountered:

- Turf and topsoil was present to a thickness of 0.5m
- Light brown very sandy clay, with some fine and medium gravel was present to a thickness 1.35m
- Medium dense dark brown, clayey fine sand was present to a thickness of 0.25m
- Medium dense light brown fine/medium sand was present to a thickness of 1.15m
- Medium dense sandy to sandy fine and medium sub angular to sub rounded gravel to a thickness of 2.25m
- Stiff brown laminated silt clay was present to a thickness of 0.5m
- Stiff grey brown laminated and fissured clay to a thickness of 4.00m
- Very stiff grey clay to a thickness of 1.50m
- The depth to water is recorded between 2.0m and 3.80m

7.3 Soils in the eastern portion of the site are described as ‘Freely draining slightly acid loamy soils’ and soils in the western portion of the site are described as ‘Loamy soils with naturally high groundwater’ by the National Soils Research Institute.

7.4 According to the EA’s online Aquifer Designation Mapping, the superficial deposits are classified as a Primary Aquifer. These formations provide a high level of water storage and may support water supply and / or river base flow on a strategic scale. The London Clay below this is classified as Unproductive Stratum. These formations have a low permeability and have negligible significance for water supply or base flow.

7.5 Reference to the EA’s online groundwater Source Protection Zone maps indicates that the site is not located within a groundwater Source Protection Zone.

7.6 MAGIC’s (Multi-Agency Geographic Information for the Countryside) Groundwater Vulnerability Mapping indicates that the site is predominately located in area with ‘Medium to High’ risk vulnerability to groundwater flooding.

7.7 The pre-application advice provided by LBRUT indicates that the entire site is at risk from groundwater flooding.

8 EXISTING DRAINAGE / WATER MAINS

8.1 Thames Water plans of public sewers, included as Appendix A, indicates that the site is served by a 300mm diameter foul sewer beneath Kneller Road which runs in easterly direction. A 300mm surface water sewer also runs in easterly direction along Kneller Road. The manhole cover and invert levels of the nearest to the site manholes are summarised in Table 1 and are included in full together with the Thames Water sewer plans, as Appendix A.

Table 1. Manhole level details

Manhole Reference	Type of Sewer	Manhole Cover Level (mAOD)	Manhole Invert Level (mAOD)	Invert Depth (m)
6201	Foul	13.44	10.36	3.08
6202	Foul	13.63	10.30	3.33
6101	Foul	13.82	10.24	3.58
6102	Foul	14.24	10.10	4.14
7101	Foul	n/a	n/a	n/a
6204	Surface Water	n/a	n/a	n/a
6203	Surface Water	13.42	10.04	3.38
6104	Surface Water	12.63	9.97	2.66
6103	Surface Water	14.30	9.82	4.48

8.2 Thames Water have advised that they have no records of flooding at the site as a result of the surcharging of public sewers.

8.3 Reference to water network plans provided by Thames Water indicates that the site is served by a 4” water main beneath Kneller Road to the south.

9 FLOOD RISK AND MITIGATION

Fluvial / Tidal Flooding

9.1 Fluvial and tidal flooding refers to flooding from surface watercourses and their tributaries, estuaries and the sea. EA mapping indicates that the site is located within Flood Zone 1, whereby the annual probability of fluvial or tidal flooding is classified as less than 1 in 1000.

9.2 Due to site's distance from the sea, the risk of coastal/tidal flooding is considered to be low. The SFRA indicates that no flood events have occurred within the vicinity of the site.

9.3 The Planning Practice Guidance (PPG) details the suitability of different land uses within each flood zone. The proposed land use is classified as 'more vulnerable' and such uses are generally considered compatible with Flood Zone 1.

9.4 Overall, on the basis of the information above, the risk associated with flooding from fluvial or tidal sources is considered to be low.

Flooding from Sewers

9.5 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.

9.6 Thames Water have confirmed that they hold no records of sewer flooding at the site itself. The SFRA mapping indicates that Thames Water records of sewer flooding show 1 outdoor incident occurring within the vicinity of the site; however, the exact location is not specified.

9.7 Overall, the risk associated with flooding from sewers is considered to be low.

Surface Water Flooding (Overland Flow)

9.8 This can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.

9.9 A band of surface water risk is present around the western, northern and eastern boundaries of the site which is primarily 'Low' risk. The map indicates an area within the north-western corner of the site which is at 'Low', 'Medium' and 'High' risk of surface water flooding. This is associated with topographical low where the surface runoff is ponding. As discussed in section 6.8 above the EA's map for Surface Water flooding indicates that during the 1 in 100 year flood event (the medium flood risk), the flood depth of surface water pooling near the existing buildings (and potentially next to the proposed buildings) is less than 300mm. During the 1 in 1000 year event the predicated flood depth is between 300mm and 600mm. However, considering the topography of the area it is not expected that the depth would significantly exceed 300mm. A suitable surface water drainage strategy implemented at the site, (presented in a separate report), is expected to alleviate the risk of surface water flooding in the area.

9.10 As explained in section 6.12 above, it appears that the building footprint of the new buildings within the flood area is not bigger than the building footprint of the existing buildings in this area. As such, no additional flood volume will be displaced, and no flood compensation would be required.

9.11 The maximum predicted flood depth along the linear areas at "Low" risk of surface water flooding to the north and east is up to 300mm. The SFRA indicates that the site is at risk from surface water flooding, however it does not indicate that there have been any recorded incidents of surface water flooding in the vicinity of the site.

9.12 Where there is identified surface water risk at the site it is recommended that at least 300mm of flood resistance/resilience measures are incorporated into the development design.

9.13 Design plans indicate that at the sports centre the finished floor level and access doors will be raised by at least 300mm above existing ground levels at the location of surface water risk in the north.

9.14 At the teaching block floor levels and access doors will also be raised by at least 300mm above existing ground levels at the location of surface water risk in the north.

9.15 The proposed measures will prevent the ingress of flood water within the buildings.

Groundwater Flooding

9.16 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures. The pre-application advice provided by LBRUT indicates that the entire site is at risk from groundwater flooding. However, BGS mapping indicates that the site is underlain by Kempton Park Gravel and Taplow Gravel Member, overlying London Clay, with depth to water between 2.0m and 3.80m.

9.17 The site is situated within an area where there *is 'potential for groundwater flooding to occur at surface'* according to the SFRA however the SFRA does not indicate that any groundwater flooding incidents have been recorded in the vicinity of the site.

9.18 In addition, no basement levels are proposed in the new buildings. However, the swimming pool will require excavation. As such a basement impact assessment will be included as part of the planning application.

9.19 Therefore, the risk of groundwater flooding is considered to be low to medium.

Other Sources

9.20 There is a limited risk of flooding occurring as a result of a break in a water main. The locations of the water mains in the immediate vicinity of the site are described in Section 8.

9.21 As described in the previous sections, the EA flood risk from reservoir mapping indicates that the site is partially located in an area potentially at risk from reservoir flooding.

9.22 The EA state that reservoir flooding is 'extremely unlikely' to happen. All large reservoirs must be inspected and supervised by reservoir panel engineers. The EA are the enforcement authority for the Reservoirs Act 1975 in England. They ensure that reservoirs are inspected regularly, and essential safety work is carried out. Therefore, the risk of flooding associated with reservoirs is considered to be low.

Proposed Mitigation Measures

9.23 In accordance with Building Regulations, it is generally considered good practice to raise the ground floor levels of all properties, even those located outside the flood risk areas, at least 150mm above external site levels and / or to ensure that external ground levels slope away from building thresholds. However, due to existing surface water flood risk around the proposed teaching and sport buildings, it is recommended that the FFL of these buildings are raised by approximately 300mm above the existing ground level.

9.24 Appropriate resilience and resistance measures are recommended to be implemented in the building re-construction. Water resilient materials have low permeability or are waterproof and they ensure that the amount of drying out is limited. It is also recommended that electrical infrastructure like plug sockets, wiring and electrical appliances are placed at a freeboard level above the floor level.

9.25

10 SEQUENTIAL TEST AND EXCEPTION TEST

10.1 The LBRUT have indicated that an application of a detailed sequential test will be required for the site. This will be provided in a separate document.

11 SUMMARY AND CONCLUSIONS

11.1 The aim of the FRA is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been prepared in accordance with the guidance detailed in the NPPF. Reference has also been made to the CIRIA SuDS manual (C753), the SFRA and the SWMP.

11.2 The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in Table 4.

Table 2. Proposed mitigation

Source of Flooding	Identified Risk			Mitigation Proposed	Residual Risk		
	L	M	H		L	M	H
Fluvial/Tidal	✓			No mitigation necessary	✓		
Sewers	✓			No mitigation necessary	✓		
Surface Water		✓		Finished floor levels and access entrances located within the surface water flood extent will be raised by 300mm above surrounding ground levels.	✓		
Groundwater		✓		Flood resilient building techniques, including tanking, should be used during the basement extension where appropriate.	✓		
Other Sources (e.g. reservoirs, water mains)	✓			No mitigation necessary	✓		

11.3 The site is located within Flood Zone 1 however it is indicated to be at significant risk from surface water flooding. In particular, an area located in the north western corner of the site is at 'Low' to 'High' risk from surface water flooding. This is associated with topographical low where the surface runoff is ponding. Currently this area is not occupied and consist of green space. The predicted flood depth at this location is between 300mm and 900mm during both 1 in 100 and 1 in 1000 storm events. The predicted flood depth around the northern boundaries of the proposed teaching and sports buildings is less than 300mm during the 1 in 100 year event and between 300mm and 600mm during the 1 in 1000 year event. A suitable surface water drainage strategy implemented at the site, is expected to alleviate the risk of surface water flooding. In addition, at the location of surface water risk finished floor levels and all external entrances are to be raised by at least 300mm above surrounding ground levels.

11.4 Whilst the borehole records from the BGS Maps indicate that the depth to ground water is more than 2.0m, the LBRUT pre-application advice and the SFRA advise that the site is at risk from groundwater flooding.

11.5 No other significant flood risks have been identified from any of the other sources assessed.

11.6 Due to existing surface water flood risk around the proposed teaching and sport buildings, it is recommended that the FFL of these buildings are raised by approximately 300mm above the existing ground level. Appropriate resilience and resistance measures are also recommended to be implemented in the building re-construction.

APPENDICES

Appendix A

Thames Water Sewer Flooding Records and Asset Location Plans

Asset location search

Property Searches

RPS
20 Farringdon St
LONDON
EC4A 4EN

Search address supplied 65
Kneller Road
Twickenham
TW2 7DN

Your reference HLEF82498

Our reference ALS/ALS Standard/2022_4570537

Search date 14 January 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: 65, Kneller Road, Twickenham, TW2 7DN

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

Asset location search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TQ1474SE

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.

The following quartiles have been printed as they fall within Thames' water area:

TQ1474SE

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

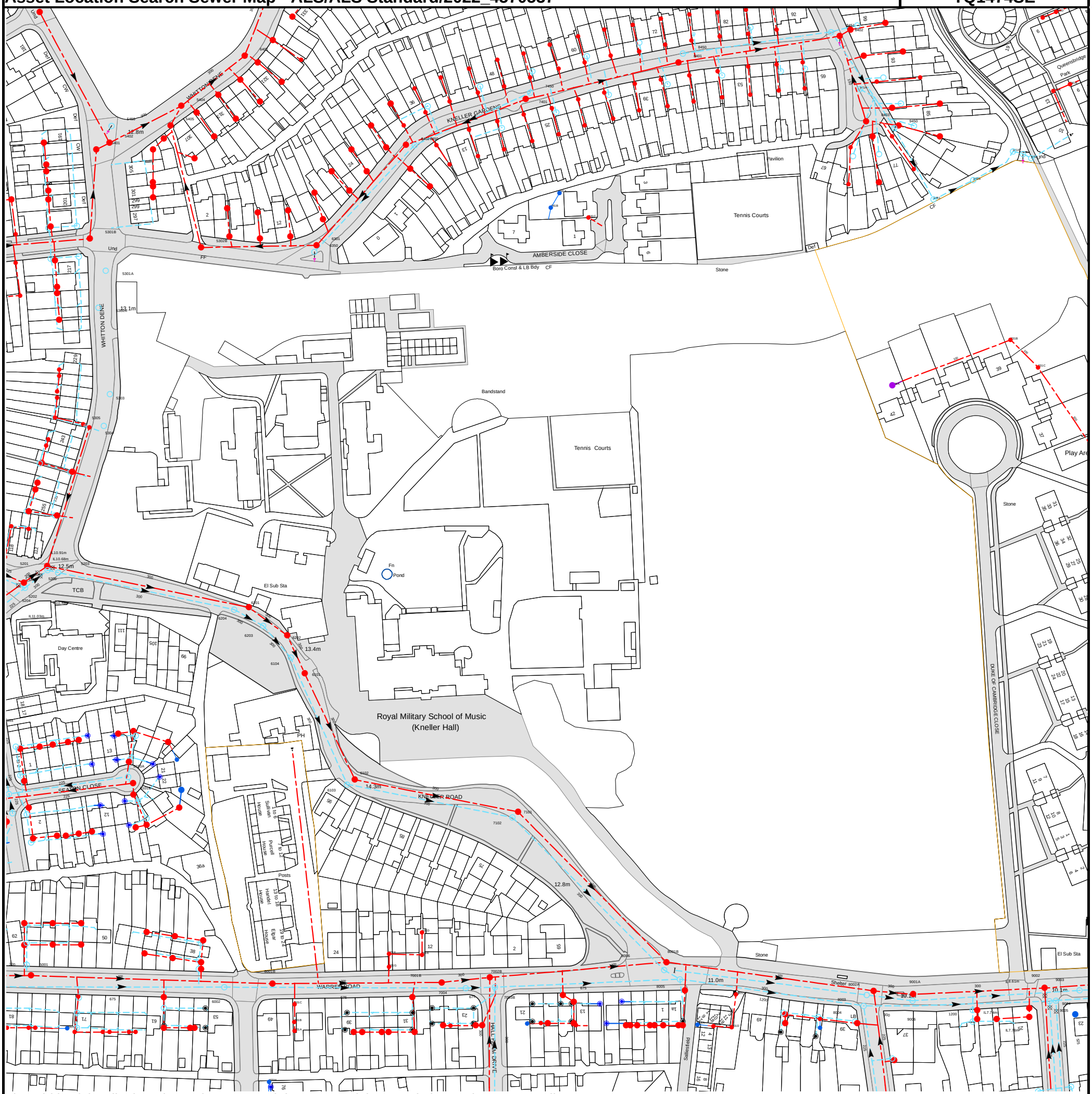
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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_4570537

TQ1474SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 514750,174250

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
5205	12.64	10.48
5201	12.61	10.85
52WQ	n/a	n/a
52WS	n/a	n/a
52WR	n/a	n/a
52YZ	n/a	n/a
52ZV	n/a	n/a
5102B	14.12	11.99
90YS	n/a	n/a
90YR	n/a	n/a
90ZW	n/a	n/a
9002	9.93	8.85
9005	9.83	n/a
9004	9.83	7.18
90ZY	n/a	n/a
90ZR	n/a	n/a
9003	9.9	8.15
941C	n/a	n/a
941D	n/a	n/a
8451	12	n/a
84NO	n/a	n/a
84NS	n/a	n/a
74OQ	n/a	n/a
84LM	n/a	n/a
84LP	n/a	n/a
84LS	n/a	n/a
84ML	n/a	n/a
84NN	n/a	n/a
94KT	n/a	n/a
84PP	n/a	n/a
94LL	n/a	n/a
8402	11.91	9.75
84PR	n/a	n/a
84QO	n/a	n/a
94LM	n/a	n/a
74NT	n/a	n/a
84KO	n/a	n/a
84KQ	n/a	n/a
84KT	n/a	n/a
84MO	n/a	n/a
84MR	n/a	n/a
84NK	n/a	n/a
84OO	n/a	n/a
74OK	n/a	n/a
84KP	n/a	n/a
84OM	n/a	n/a
84KR	n/a	n/a
84OK	n/a	n/a
84LK	n/a	n/a
84QQ	n/a	n/a
84MP	n/a	n/a
84MS	n/a	n/a
84NL	n/a	n/a
8401	12.57	n/a
8450	12.68	n/a
74OR	n/a	n/a
84LN	n/a	n/a
74PQ	n/a	n/a
84LQ	n/a	n/a
84LT	n/a	n/a
84MM	n/a	n/a
84NQ	n/a	n/a
74LT	n/a	n/a
74KQ	n/a	n/a
74ML	n/a	n/a
74LK	n/a	n/a
7401	13.16	11.29
7450	13.18	n/a
74MM	n/a	n/a
74PM	n/a	n/a
74KT	n/a	n/a
74NK	n/a	n/a
741B	n/a	n/a
74MP	n/a	n/a
74QK	n/a	n/a
74NL	n/a	n/a
74MO	n/a	n/a
741A	n/a	n/a
74MS	n/a	n/a
74NN	n/a	n/a
74MR	n/a	n/a
74NO	n/a	n/a
74PO	n/a	n/a
741C	n/a	n/a
74ON	n/a	n/a
74NR	n/a	n/a
74PS	n/a	n/a
74OO	n/a	n/a
74NQ	n/a	n/a
931A	n/a	n/a
931C	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
931B	n/a	n/a
9451	10.92	10.09
84OQ	n/a	n/a
94KL	n/a	n/a
941G	n/a	n/a
94KM	n/a	n/a
941I	n/a	n/a
84QK	n/a	n/a
9452	n/a	n/a
94LN	n/a	n/a
941F	n/a	n/a
84OR	n/a	n/a
94KN	n/a	n/a
84OT	n/a	n/a
94KP	n/a	n/a
9450	11.27	10.31
94KQ	n/a	n/a
94LO	n/a	n/a
8403	11.13	10.03
94KS	n/a	n/a
94LQ	n/a	n/a
94KR	n/a	n/a
941A	n/a	n/a
841A	n/a	n/a
941B	n/a	n/a
94LK	n/a	n/a
94LS	n/a	n/a
801D	n/a	n/a
801B	n/a	n/a
80ZQ	n/a	n/a
80ZR	n/a	n/a
70YW	n/a	n/a
70YZ	n/a	n/a
70YX	n/a	n/a
70YY	n/a	n/a
70ZP	n/a	n/a
80ZP	n/a	n/a
70XQ	n/a	n/a
801A	n/a	n/a
70WW	n/a	n/a
70XP	n/a	n/a
70WV	n/a	n/a
80YW	n/a	n/a
80YT	n/a	n/a
80XX	n/a	n/a
80YV	n/a	n/a
80XZ	n/a	n/a
70WZ	n/a	n/a
70WY	n/a	n/a
801C	n/a	n/a
80YZ	n/a	n/a
8005	11.32	7.84
8006	11.69	8.59
8001B	11.66	9.22
80YQ	n/a	n/a
80XW	n/a	n/a
80YS	n/a	n/a
8004	10.13	7.35
8003	10.23	8.53
8002A	10.23	8.8
90XX	n/a	n/a
90XV	n/a	n/a
9006	10.05	8.47
9001A	10.1	8.74
90YY	n/a	n/a
90YZ	n/a	n/a
90YP	n/a	n/a
90XZ	n/a	n/a
90YT	n/a	n/a
5403	12.82	n/a
5405	12.66	9.72
5450	12.92	n/a
64OK	n/a	n/a
54MK	n/a	n/a
5404	12.81	9.41
64NR	n/a	n/a
54MM	n/a	n/a
64NO	n/a	n/a
64NS	n/a	n/a
64NP	n/a	n/a
64NL	n/a	n/a
6401	13.41	9.21
64NM	n/a	n/a
64OL	n/a	n/a
64KL	n/a	n/a
64KT	n/a	n/a
64LL	n/a	n/a
64LM	n/a	n/a
64LO	n/a	n/a
64LP	n/a	n/a
64LR	n/a	n/a
64LS	n/a	n/a
6402	12.94	n/a

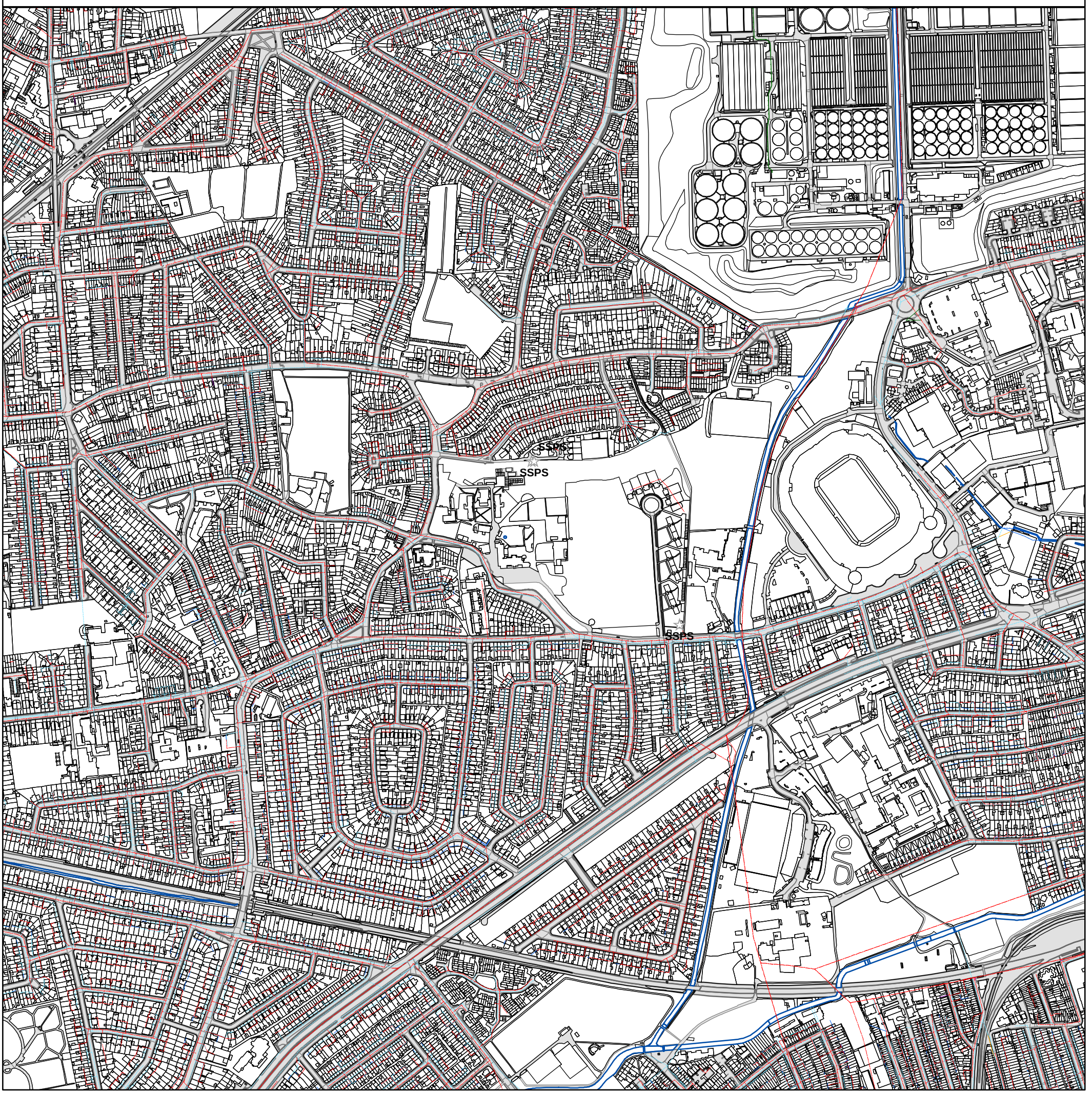
Manhole Reference	Manhole Cover Level	Manhole Invert Level
64MO	n/a	n/a
64MK	n/a	n/a
6450	12.92	11.65
64ML	n/a	n/a
64MT	n/a	n/a
64MN	n/a	n/a
64MQ	n/a	n/a
74LM	n/a	n/a
74LN	n/a	n/a
74KM	n/a	n/a
74LP	n/a	n/a
74KO	n/a	n/a
74LQ	n/a	n/a
74KN	n/a	n/a
74OT	n/a	n/a
74KR	n/a	n/a
74LS	n/a	n/a
74QM	n/a	n/a
53TQ	n/a	n/a
53TV	n/a	n/a
53TW	n/a	n/a
54YQ	n/a	n/a
54ZT	n/a	n/a
54ZV	n/a	n/a
54ZW	n/a	n/a
54ZX	n/a	n/a
54ZY	n/a	n/a
53WT	n/a	n/a
5301A	n/a	n/a
53WS	n/a	n/a
53VQ	n/a	n/a
6350	12.26	n/a
5302B	12.21	9.92
6301	12.32	n/a
5301B	12.82	n/a
63KO	n/a	n/a
63KM	n/a	n/a
63KQ	n/a	n/a
53TR	n/a	n/a
64KR	n/a	n/a
64KO	n/a	n/a
64KP	n/a	n/a
64KN	n/a	n/a
54KQ	n/a	n/a
64KQ	n/a	n/a
54KR	n/a	n/a
54KS	n/a	n/a
64KS	n/a	n/a
54LR	n/a	n/a
54KT	n/a	n/a
5401	12.8	9.98
5402	12.89	9.29
54LK	n/a	n/a
54LT	n/a	n/a
53ZX	n/a	n/a
53ZY	n/a	n/a
52ZW	n/a	n/a
52ZX	n/a	n/a
52XW	n/a	n/a
52YP	n/a	n/a
52YQ	n/a	n/a
53ZT	n/a	n/a
53VX	n/a	n/a
51SR	n/a	n/a
51SQ	n/a	n/a
6101	13.82	10.24
6104	12.63	9.97
6202	13.63	10.3
6203	13.42	10.04
6204	n/a	n/a
6201	13.44	10.36
5203	n/a	n/a
52ZT	n/a	n/a
52ZY	n/a	n/a
52XT	n/a	n/a
52XZ	n/a	n/a
5305	12.76	11.17
53XW	n/a	n/a
5304	n/a	n/a
53YT	n/a	n/a
53XY	n/a	n/a
53YV	n/a	n/a
53YW	n/a	n/a
5303	n/a	n/a
53YX	n/a	n/a
53YY	n/a	n/a
53YZ	n/a	n/a
53WW	n/a	n/a
5302A	n/a	n/a
53WV	n/a	n/a
51YY	n/a	n/a
51YQ	n/a	n/a
51YZ	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
51ZP	n/a	n/a
51YR	n/a	n/a
5204	12.67	10.61
5202	12.72	10.99
50TS	n/a	n/a
50ST	n/a	n/a
50SV	n/a	n/a
50SW	n/a	n/a
50QY	n/a	n/a
50QX	n/a	n/a
51WX	n/a	n/a
51WW	n/a	n/a
51WY	n/a	n/a
51WZ	n/a	n/a
51PX	n/a	n/a
51QP	n/a	n/a
51QT	n/a	n/a
51QQ	n/a	n/a
51RS	n/a	n/a
51PZ	n/a	n/a
51QR	n/a	n/a
5101B	14.43	12.52
5103A	14.41	12.76
51RY	n/a	n/a
51RZ	n/a	n/a
51TR	n/a	n/a
51ZQ	n/a	n/a
51ZR	n/a	n/a
51SP	n/a	n/a
51ZS	n/a	n/a
51TS	n/a	n/a
5105A	13.87	11.99
5104B	14.08	12.23
50QV	n/a	n/a
50QW	n/a	n/a
50RR	n/a	n/a
50RS	n/a	n/a
51VX	n/a	n/a
50RT	n/a	n/a
51WT	n/a	n/a
5001	15.53	10.81
51VY	n/a	n/a
51WV	n/a	n/a
50QQ	n/a	n/a
501A	n/a	n/a
50WR	n/a	n/a
50XY	n/a	n/a
50XX	n/a	n/a
50WQ	n/a	n/a
50XW	n/a	n/a
50QR	n/a	n/a
50WS	n/a	n/a
50WT	n/a	n/a
50WV	n/a	n/a
50WW	n/a	n/a
50RZ	n/a	n/a
50ZT	n/a	n/a
50YT	n/a	n/a
50YV	n/a	n/a
50RY	n/a	n/a
50YW	n/a	n/a
50YX	n/a	n/a
50TR	n/a	n/a
50SP	n/a	n/a
50SS	n/a	n/a
50SR	n/a	n/a
6002	15.94	9.08
601H	n/a	n/a
6001B	15.62	10.11
601B	n/a	n/a
601A	n/a	n/a
601C	n/a	n/a
6103	14.3	9.82
60YR	n/a	n/a
6102	14.24	10.1
60YQ	n/a	n/a
60YP	n/a	n/a
60XZ	n/a	n/a
601G	n/a	n/a
601F	n/a	n/a
60XX	n/a	n/a
60XY	n/a	n/a
601E	n/a	n/a

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_4570537



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	Rveldhur
Print Date:	14/01/2022
Map Centre:	514747,174217
Grid Reference:	TQ1474SE

Comments:

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 divects 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_4570537

TQ1474SE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 514750,174250

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_4570537

0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	Rveldhur
Print Date:	14/01/2022
Map Centre:	514747,174217
Grid Reference:	TQ1474SE

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: Indicates 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.

Sewer Flooding
History Enquiry

Property Searches

RPS

20 Farringdon St

Search address supplied	Kneller Hall 65 Kneller Road Twickenham TW2 7DN
Your reference	HLEF82498
Our reference	SFH/SFH Standard/2022_4570540
Received date	**14 January 2022**
Search date	**20 January 2022**

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

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: Kneller Hall,65,Kneller Road,Twickenham,TW2 7DN

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

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0800 009 4540

Sewer Flooding
History Enquiry

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

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0800 009 4540

Appendix B

Topographic Survey

OS NORTH

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker
BH	Borehole	MT	Mercury Telecom Cover
BOL	Bollard	OHC	Overhead Cable
BT	British Telecom Cover	OHP	Overhead Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
BWK	Brickwork	PB	Post Box
CATV	Cable TV Cover	PCH	Post and Chain Fence
CB	Close Boarded Fence	PR	Post & Rail Fence
CCTV	Closed Circuit TV	PW	Post & Wire Fence
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence
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LB	Litter Bin	WKH	Water Key Hole
LC	Lamp Column	WM	Water Meter
LP	Lamp Post	WV	Water Valve
MH	Manhole		

Sheet Layout Diagram:

Notes

The survey has been oriented to Ordnance Survey (OS) National Grid (OSGB36) using Industry Standard Network RTK GPS equipment utilising the OS Active Network (OS Net). A true OSGB36 coordinate has been established on site using the OSTN15 (transformation) & OSGB15 (geoid) models. The survey detail has been corrected to this point and a further one (or more) OSGB36 points established to produce a true OS bearing for angle orientation. Scale factor 1.0 has been applied therefore the survey coordinates are shown on a pseudo OS grid.
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Rev	Svyr	QA Check	Description	Date
5	-	-	-	-
4	-	-	-	-
3	-	-	-	-
2	-	-	-	-
1	-	-	-	-
0		AG	First Complete Issue	22/01/2021
Prelim		-	Preliminary - Not Complete	-

Drawn in BricsCAD – www.bricsys.com part of www.hexagon.com

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Land and Engineering Surveying Since 1979

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5th Floor 1 Temple Way BRISTOL. BS2 0BY T +44 (0)117 301 8137
Unit G9, The Arch, 48-52 Floodgate St BIRMINGHAM. B5 5SL T +44(0)121 752 1220

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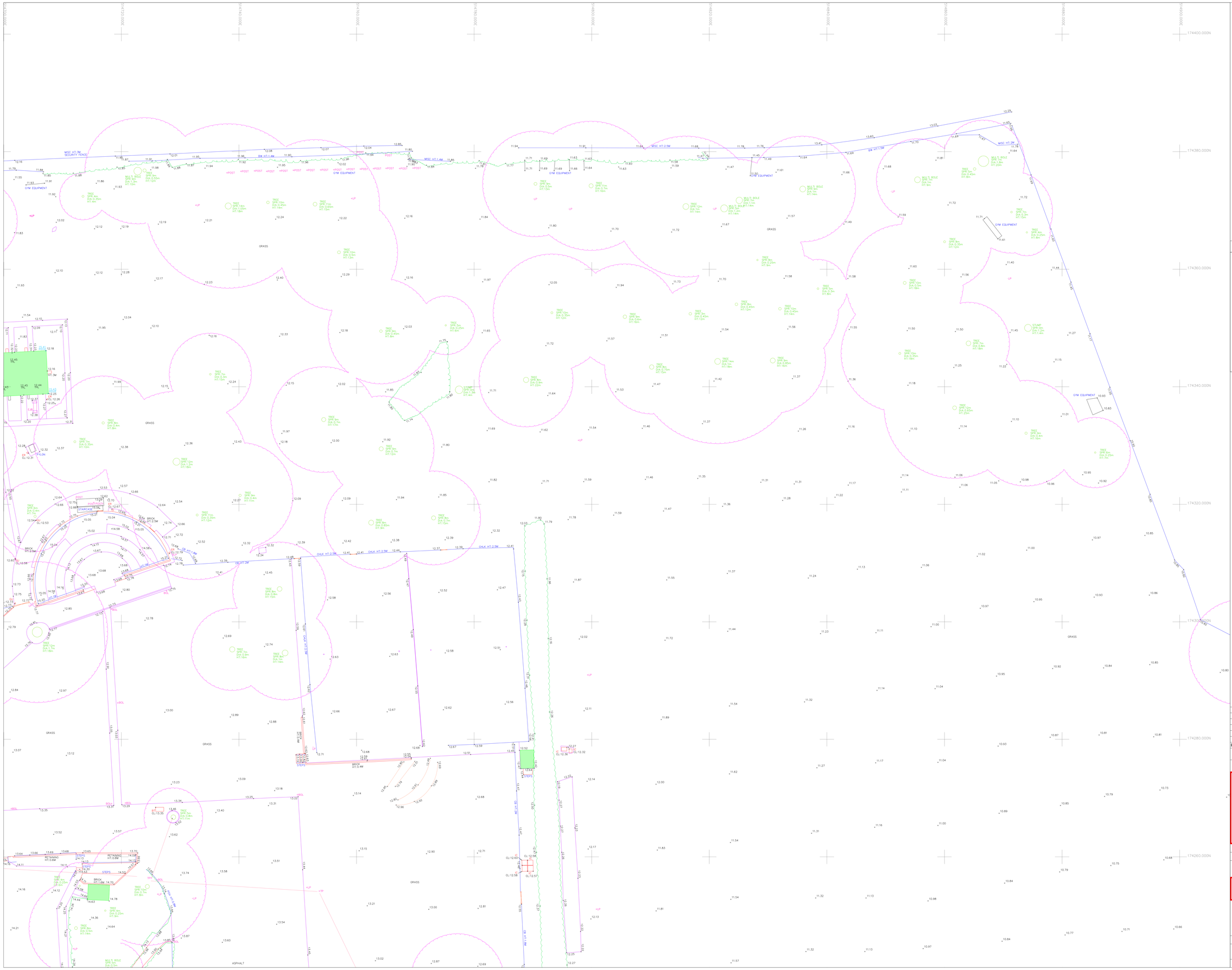
SURVEYED	EW	WOOD PLC
DRAWN	EW	
SCALE	1:200	

A24 – Kneller Hall

TOPOGRAPHICAL SURVEY

JOB No	DRAWING NUMBER
LT/220/0504	LT/220/0504/P/0001a

A0 Sheet - 1,189mm X 841mm



OS NORTH

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TOPOGRAPHICAL SURVEY

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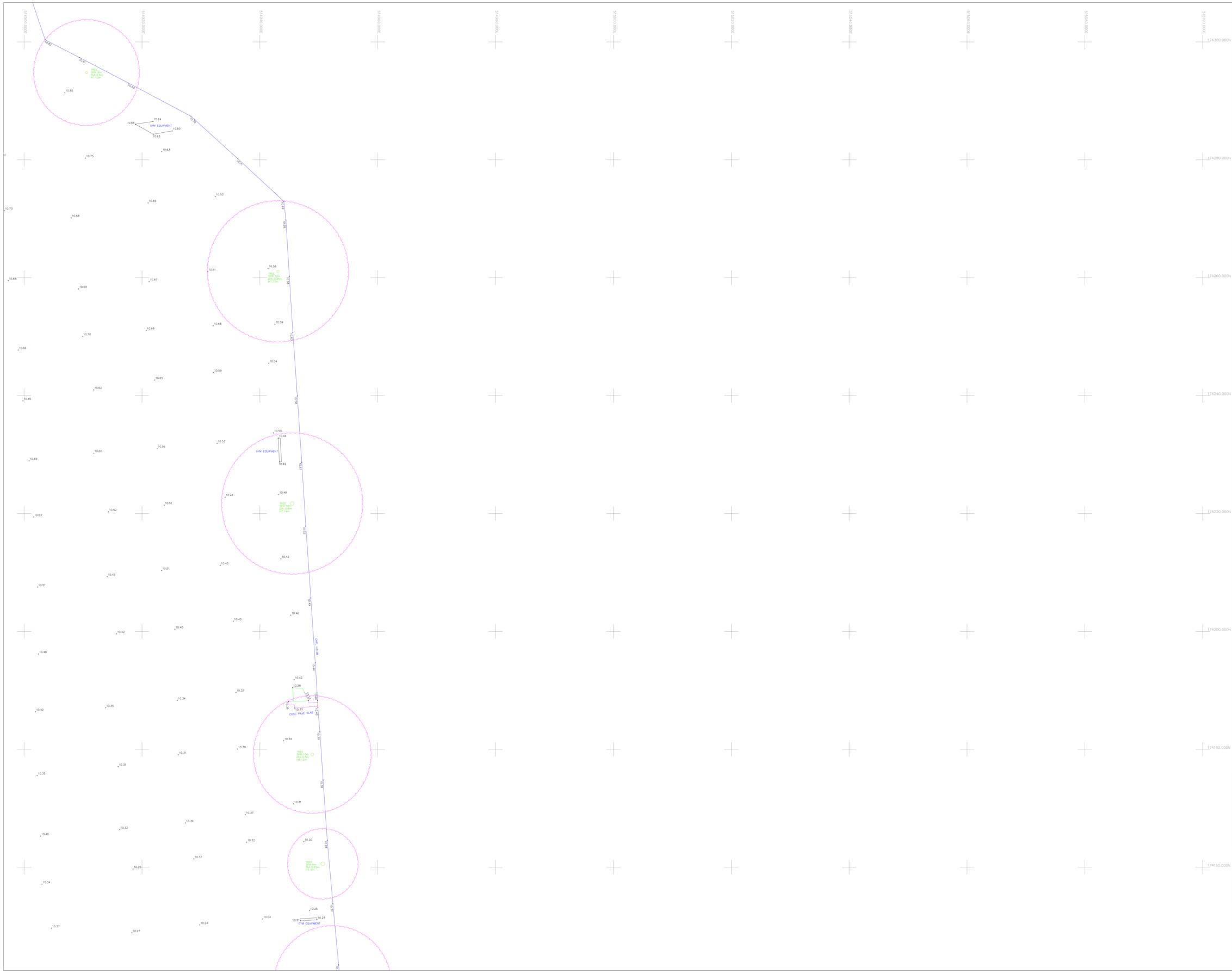

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IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	UTL	Unable To Lift
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Sheet Layout Diagram:

Notes

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0		AG	First Complete Issue	22/01/2021
Prelim		-	Preliminary - Not Complete	-

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SURVEYED	EW
DRAWN	EW
SCALE	1:200

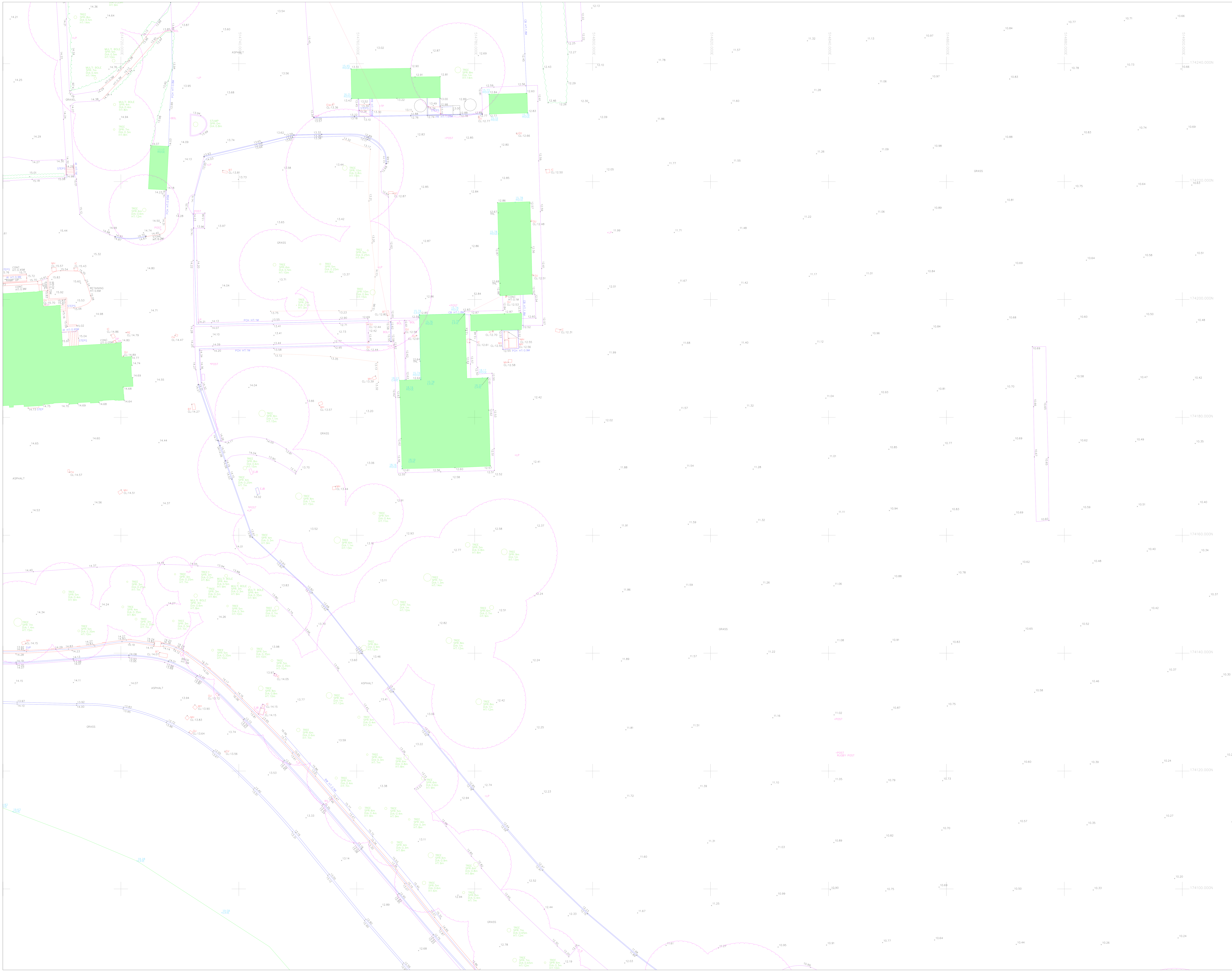
WOOD PLC

A24 – Kneller Hall

TOPOGRAPHICAL SURVEY

JOB No	DRAWING NUMBER
LT/220/0504	LT/220/0504/P/0001d

A0 Sheet - 1,189mm X 841mm



OS NORTH

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker
BH	Borehole	MT	Mercury Telecom Cover
BOL	Bollard	OHC	Overhead Cable
BT	British Telecom Cover	OHP	Overhead Pipe
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BWK	Brickwork	PB	Post Box
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CL	Cover Level	RG	Road Gully
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CPS	Conc Paving Slabs	RW	Retaining Wall
DIA	Diameter	RWP	Rain Water Pipe
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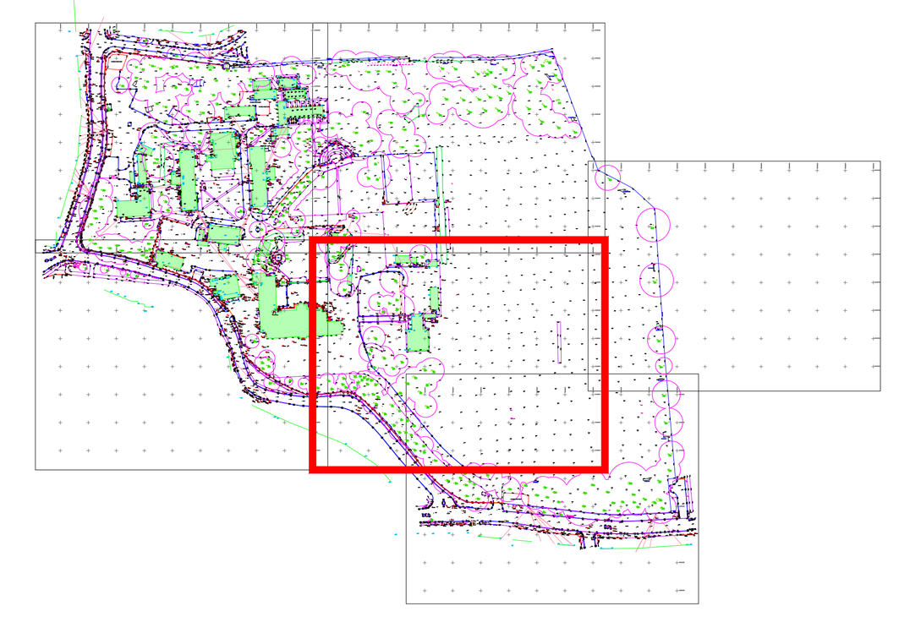

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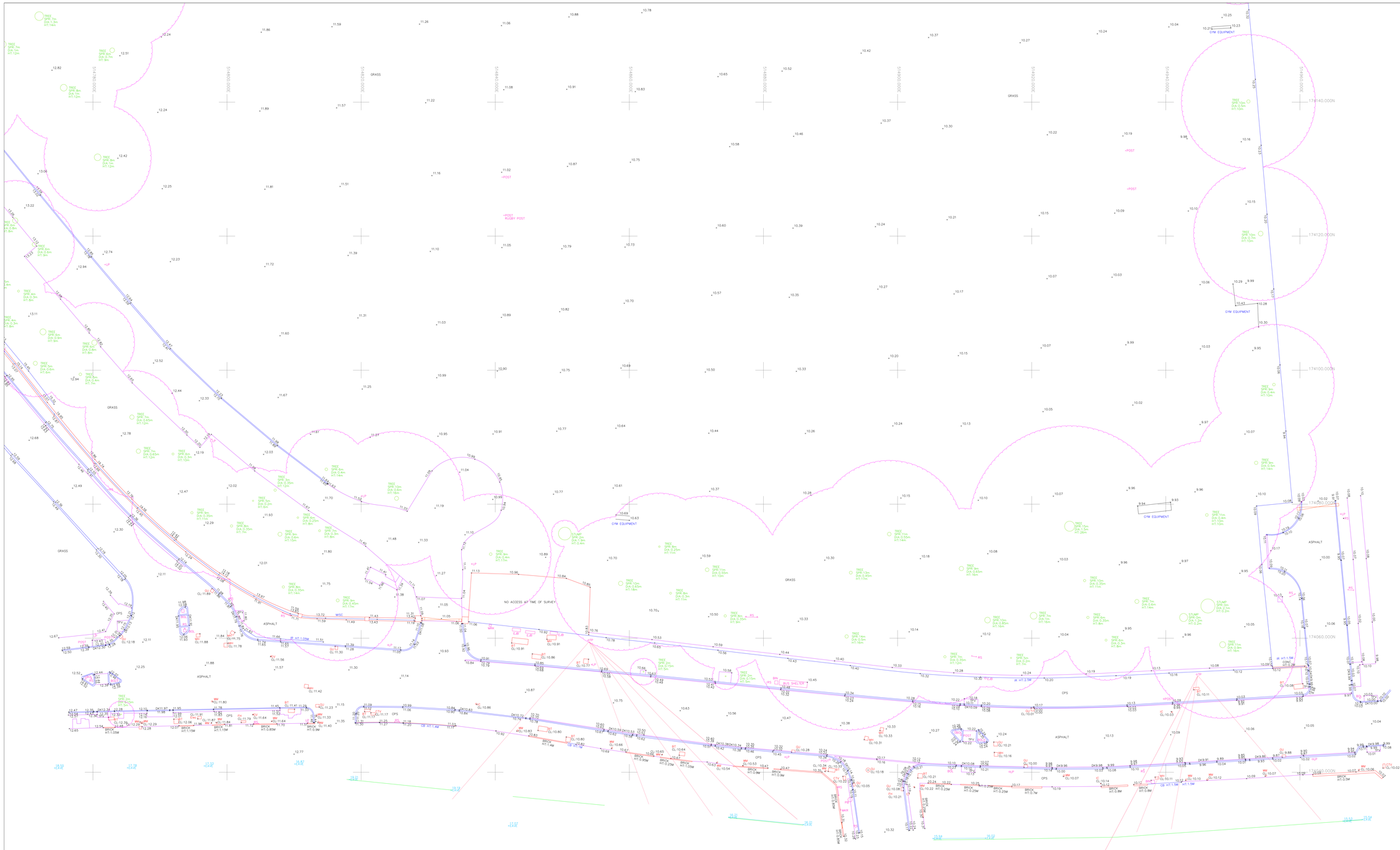
SURVEYED	EW	WOOD PLC
DRAWN	EW	
SCALE	1:200	

A24 – Kneller Hall

TOPOGRAPHICAL SURVEY

JOB No	DRAWING NUMBER
LT/220/0504	LT/220/0504/P/0001e

A0 Sheet - 1,189mm X 841mm



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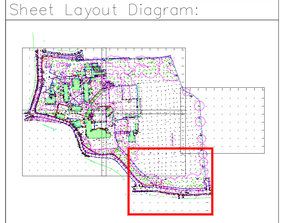

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