



Flood Risk Assessment

Barnes Primary School, Cross Street, London, SW13 0QQ

Client Name: McBains

Project Number: P4031.2.0

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Site:	Barnes Primary School, Cross Street, London, SW13 0QQ
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Contents

1	Introduction	4
1.1	Site-Specific Flood Risk Assessment (FRA).....	4
1.2	Site Setting	5
1.3	Site Topography	5
1.4	Existing Site Drainage.....	5
1.5	Surface Water Bodies / Features	6
1.6	Geology and Ground Permeability	6
2	Development Proposal.....	7
2.1	Vulnerability Classification of the development	7
2.2	Proposed Finished Floor Levels.....	7
2.3	Proposed Site Drainage	7
3	Flood Zone Classification.....	8
3.1	Flood Defences.....	8
3.2	Historic Flooding	8
3.3	Thames Tidal Upriver Breach Inundation Modelling	9
3.3.1	Thames Tidal Breach Modelling.....	9
3.3.2	Beverley Brook: Fluvial Flood Hazard	10
3.4	Surface Water (Pluvial) Flooding.....	10
3.5	Sewer Flooding.....	10
3.6	Groundwater Flooding	11
3.7	Flooding from Artificial Sources.....	11
3.8	Critical Drainage Areas	11
3.9	Climate Change	11
4	Summary and Conclusion	13
4.1	FRA Summary Points	13
4.2	Mitigation Measures.....	15
4.2.1	Finished Floor Levels (FFLs)	15
4.2.2	Surface Water Management	16
4.2.3	Advisory Note	16
4.3	Concluding Comments.....	16
5	Closure	17
6	References	18

Appendices

APPENDIX A Site Location Map and Current Site Layout

APPENDIX B Topographic and Utility Survey

APPENDIX C Surface Water Features Map

APPENDIX D Development Plans

APPENDIX E Flood Zone Map (EA¹ map extracts)

APPENDIX F Historic Flooding (SFRA² map extract)

APPENDIX G Thames Tidal Upriver Breach Inundation Modelling (EA)

APPENDIX H Fluvial Flood Hazard Mapping (SFRA map extract)

APPENDIX I Surface Water (Pluvial) Flooding (EA map extract)

¹ EA = Environment Agency

² SFRA = Strategic Flood Risk Assessment

1 Introduction

agb Environmental has been commissioned by McBains to undertake a Flood Risk Assessment (FRA) to accompany an educational development proposal at the site known as '**Barnes Primary School, Cross Street, London, SW13 0QQ**' (hereafter referred to as 'the site'). The proposal comprises demolition of an existing residential property, and construction of a new two storey educational building. Detail regarding the proposed development is provided within Section 2.

1.1 Site-Specific Flood Risk Assessment (FRA)

In accordance with the National Planning Policy Framework (NPPF) and Environment Agency Guidance, a Site Specific Flood Risk Assessment (FRA) should be both proportionate to the degree of flood risk and appropriate to the scale, nature, and location of the proposed development or land use.

As the proposed development use is educational, the Flood Risk Vulnerability Classification is determined as "More Vulnerable" (as defined by NPPF); which (subject to an FRA) would be considered appropriate within Flood Zone 1, 2 or 3a.

In recognition that the site covers an area of approximately 0.021 hectare (ha) and is located within Flood Zone 1, but immediately adjacent to Flood Zone 3; a **Level 2 Flood Risk Assessment (FRA): Scoping Study** has been conducted. The FRA references the EA guidance documents for 'Flood Risk Assessment in Flood Zone 1 and Critical Drainage Areas', and 'Standing Advice for Vulnerable Developments'.

The aim of the FRA is to provide an appraisal of the potential flood risk posed to the site, and equally the potential impact that the proposed development may have on flood risk to land or property external to the site. The Scoping Study will identify whether or not there are flooding or surface water management issues that require additional consideration, and consequently completion of a more detailed Flood Risk Assessment.

In completing the FRA, the following data sources were referenced:

- London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) update (March 2016).
- London Borough of Richmond upon Thames Surface Water Management Plan (SWMP) (2011).
- London Borough of Richmond upon Thames Local Flood Risk Management Strategy (LFRMS) 2014 – 2020 (2014).
- London Borough of Richmond upon Thames Preliminary Flood Risk Assessment (PFRA) (2011). (*The PFRA was reviewed in 2017; the Richmond Borough website states that following the review there was no change to the assessment of risk: https://www.richmond.gov.uk/preliminary_flood_risk_assessment*)
- An Environment Agency Product 4 and Product 8: Detailed FRA / FCA Map centred on 'Barnes Primary School, Cross Street, London, SW13 0QQ' (ref: KSL 184788 AC) (2020).

The Level 2 FRA: Scoping Study did not include a specific flood risk Site Reconnaissance.

The development proposal constitutes a change of use. The Sequential Test is therefore not required for this site.

1.2 Site Setting

The subject site is located on the eastern side of Cross Street, 30m south of the junction of Cross Street and Westfields Avenue, approximately 300m south of Barnes Bridge Station, in the London Borough of Richmond upon Thames. The rectangular shaped plot covers an area of approximately 0.021ha; and is centred at National Grid Reference TQ 21561 75909.

The site comprises a two storey brick built residential house located at the centre of the site; with an attached brick built garage extending from the front (west) of the house. The front garden (fronting Cross Street) is part concrete surfaced, and part grassed. The eastern third of the site (rear of the house) is a private residential garden comprising grass; and paved and decked sections. The rear garden is defined by brick walls (north and south) and by a feather edge fence at the eastern perimeter, which separates the site from the playground of Barnes Primary School. Within the front garden (western site section) the site is defined by feather edged fencing north and south; and has an open perimeter to Cross Street west of the site.

The site is entered from Cross Street along the western perimeter.

The site is bordered by residential housing to the north and south; and with the playground of Barnes Primary School adjacent to the eastern perimeter. The western perimeter is defined by Cross Street with the Brown Dog Public House beyond. The site is within a predominantly residential area.

The Site Location Map and Current Site Layout are provided within Appendix A.

1.3 Site Topography

A site specific Topographic Survey of the site (dated 30th July 2020) is included within Appendix B.

Ground elevations indicate the site to be broadly flat, with an elevation of 6.63mAOD within the western site section (front garden), and 6.59mAOD within the eastern site section (rear garden). A grassed section within the rear garden (adjacent to the eastern perimeter) has a slightly lower elevation of 6.46mAOD.

The threshold level to the existing house is shown to be 6.81mAOD.

The site elevation is broadly the same as the pavement adjacent to western site perimeter, which is indicated to be 6.59mAOD; falling to 6.47mAOD in Cross Street.

Published Ordnance Survey mapping indicates a gentle fall in elevation to the east / south-east. A 5.00mAOD contour is located approximately 100m south-east of the site.

1.4 Existing Site Drainage

A Utility Survey was incorporated with the Topographical Survey, and is presented within Appendix B.

Surface Water Drainage from the existing house is not clearly defined. An assumed route is indicated from the garage section to the manhole located at the extreme western corner of the site, adjacent to the pavement on Cross Street.

Foul Water Drainage is indicated exiting the northern side of the house, extending west (along the northern perimeter) to a manhole located outside the survey area on Cross Street. A gully / down pipe appears to connect into the foul drain at the northern perimeter of the house; although it is noted that a combined drain is *not* indicated on the survey.

1.5 Surface Water Bodies / Features

The closest watercourse to the site is a culverted drain beneath the existing Barnes Primary School approximately 60m east of the site (referenced as part of the Beverley Brook). The drain commences at Beverley Brook approximately 110m south-east of the site and flows north-west, entering the River Thames approximately 350m north-west of the site.

At its closest point, the Beverley Brook watercourse is approximately 65m south-east of the site. The watercourse flows south-west to north-east and subsequently enters the River Thames 2km east of the site.

The Beverley Brook is classified by the Environment Agency as a Main River.

A Surface Water Features map is included as Appendix C.

1.6 Geology and Ground Permeability

Published British Geological Survey (BGS) records indicate that the bedrock beneath the whole site is the London Clay Formation (comprising clay and silt).

Published BGS records indicate that the site is overlain by Superficial Deposits of the Kempton Park Gravel Member (comprising sand and gravel).

BGS public records confirm the closest published borehole to the site to be at the junction of Westfields Avenue and White Hart Lane approximately 210m south-west of the site (BGS Ref: TQ27NW12). The borehole confirms Made Ground over sand and gravel (Kempton Park Gravel Member) to a final borehole depth of 6.40m. A similar shallow geological sequence would be anticipated at the subject site. (*The report: 'Intermediate Assessment of Groundwater Flooding Susceptibility' appended to the Richmond Surface Water Management Plan [SWMP] indicates 6.0m to be the average depth of the Kempton Park Gravel Member*).

The London Clay Bedrock is classified by the Environment Agency as an Unproductive Aquifer; whereas the overlying Superficial Deposits are classified as a Secondary A Aquifer.

The management of Surface Water Discharge is referenced in Section 2.

The site is *not* located within an Environment Agency Source Protection Zone.

2 Development Proposal

At the time of preparing this Flood Risk Assessment (FRA), the proposed development comprised the following:

- **Demolition of the existing 2 storey residential house.**
- **Construction of a 2 storey Educational Building:**
 - **Ground Floor:** Internal: Therapy Room, Group Room, Sensory Room, Office, and Lobby. External: Covered Space to the rear of the building, and a Minibus Bay at the front of the building (leading from Cross Street).
 - **First Floor:** Two (2No.) Classrooms, Soft Room, Quiet Room, and an external Calming Area to the rear of the building.

Plans of the proposed development are presented within Appendix D: 'Proposed Site Layout' (Drawing ref: LOND01-MCB-XX-00-DR-A-210-S3-P2), and 'Proposed Ground and First Floor Plans' (Drawing ref: MCB-XX-ZZ-DR-A-0010-S3-P1).

2.1 Vulnerability Classification of the development

As the development is to provide an educational facility, the Flood Risk Vulnerability Classification is determined as "More Vulnerable" (as defined by NPPF); which is appropriate for Flood Zone 1, 2, and 3a subject to an appropriate FRA.

2.2 Proposed Finished Floor Levels

It is understood that Richmond upon Thames Planning Department has requested that the Finished Floor Level (FFL) of the new building to be 6.35mAOD.

It is noted that the proposed FFL is approximately 0.24m below the existing ground elevation; which is generally within the range 6.59mAOD to 6.63mAOD.

2.3 Proposed Site Drainage

Hard landscaping to the front and rear of the new building increases the impermeable hard surfacing at the site from approximately 50% to 100%.

In order to accommodate the requested FFL for the building, the external ground level across the western section of the site (from Cross Street) will be sloped at 1:20 towards the building, with surface water collected within Threshold Drains situated along the edge of the building. It is proposed that below ground attenuation would be provided in front of the building, below the Minibus Bay; with a vortex flow control limiting runoff to 1l/s discharging to the existing off-site Thames Water infrastructure.

The site does not have sufficient external space to incorporate the use of Sustainable Urban Drainage Systems (SUDS)³ using Infiltration Techniques.

Proposed Drainage Drawings were unavailable at the time of preparing this FRA. A detailed Surface Water Drainage Strategy (including drawings) is recommended to accompany the development plans.

³ SUDS – Sustainable Urban Drainage Systems

3 Flood Zone Classification

Flood Zone classifications are defined within the National Planning Policy Framework (NPPF) as follows; and relate to the potential risk from flooding by river or sea:

Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Flood Zone 3 is further classified into Flood Zone 3a (high probability) and 3b (the functional floodplain, comprising land where water has to flow or be stored in times of flood).

Environment Agency flood zone mapping indicates that the site lies within Flood Zone 1.

An area of Flood Zone 2 / 3 (area benefiting from flood defences) is situated adjacent to the eastern perimeter of the site. The Flood Zone delineation relates to the River Thames. The Royal Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA, 2016) confirms the flood zone delineation adjacent east of the site to be Flood Zone 3a. Flood Zone mapping is provided in Appendix E.

The Environment Agency / Natural Resources Wales 'Risk of Flooding from Rivers and the Sea (RoFRaS) database' generates an indication of river and coastal flood risk based on a 50m grid. The database considers the probability that any flood defences (if present) will overtop or breach, and the distance from the river or sea. **The maximum RoFRaS Flood Rating for the whole site indicates a 'Negligible' risk of flooding. An area of 'Very Low' risk of flooding (less than 1 in 1,000 [<0.1%] in any given year) is indicated adjacent east of the site; and corresponds with the Flood Zone 2 / 3 delineation.** A RoFRaS map is provided within Appendix E.

3.1 Flood Defences

The EA Product 4 (2020) data confirmed that Flood Defences are present along the River Thames approximately 350m north-west of the site.

The design Standard of Protection (SoP) of the flood defences along this area of the Thames is a 0.1% Annual Exceedance Probability (AEP) event, designed to defend up to a 1 in 1,000 year **tidal** event. The defences are man-made and privately owned. The crest level of the defences is 5.94mAOD.

3.2 Historic Flooding

The Environment Agency (EA) database of historic flooding events dating back to 1947 confirms no recorded flood event impacting the subject site (EA Product 4, 2020).

The London Borough of Richmond upon Thames SFRA (2016) indicates no events or incidents indicated in the vicinity of the subject site from river, surface water, or groundwater

sources. An extract from the SFRA Historic Flooding map is presented within Appendix F (the map is dated 2014).

3.3 Thames Tidal Upriver Breach Inundation Modelling

agb Environmental Limited (agb) requested modelled flood data from the EA for the reach of the Beverley Brook located approximately 65m south-east of the subject site as part of an EA Product 4 and Product 8 data request (EA, 2020).

The EA provided Tidal Modelling data from The Thames Tidal Upriver Breach Inundation Modelling Study by Atkins Ltd, which was completed in May 2017.

3.3.1 Thames Tidal Breach Modelling

The model approach simulated continuous tidal breaches along the entire length of the Thames from Teddington to the Thames Barrier; with breaches set at 20m or 50m width (for hard and soft defences respectively), and breach scour distances set to extend into the floodplain by the same distance as the breach width.

As the site is located upstream of the Thames Barrier, there is no return period for the modelled flood levels, as the levels are controlled by the closure of the barrier. The flood levels generated are therefore referred to as Maximum Likely Water Levels (MLWLs). The epochs modelled were 2014 and 2100; which included an allowance for climate change for the 2100 epoch.

The model was used to generate Flood Elevations (i.e. MLWLs) at multiple Node Points along Beverley Brook approximately 65m south-east of the site. A map depicting the 7 Node Point locations closest to the subject site is included within Appendix G⁴.

For the 2014 epoch, the MLWLs for all Node Points is stated as 'Nil Return'; with MLWLs for the 2100 epoch stated as between 4.82mAOD and 4.86mAOD.

The Breach Flood Extent mapping for both epochs indicates no flood impact at the subject site. A map illustrating flood extent for both the 2014 and 2100 epochs is included in Appendix G⁴.

Breach Hazard Mapping for the 2100 epoch indicates no hazard to the subject site. A hazard map is included within Appendix G⁴.

It is noted that the RoFRaS Flood Rating for the site indicates the risk of flooding across the whole site to be 'Negligible'; with a 'Very Low' risk (less than 1 in 1,000 [0.1%] in any given year) indicated adjacent east of the site. The rating is based on a breach or overtopping of existing defences. In addition, the site is afforded protection by the Thames Barrier.

The overall risk of Tidal Flooding due to a breach in flood defences is considered 'Negligible / Very Low'.

Thames Tidal Breach Modelling is taken into consideration within Section 4.2 Mitigation Measures.

⁴ [Open Government Licence](#)

3.3.2 Beverley Brook: Fluvial Flood Hazard

The London Borough of Richmond upon Thames SFRA (2016) includes Fluvial Flood Hazard Mapping for the Beverley Brook. Maps showing the flood extent of the 1 in 100 (1%) AEP (plus Climate Change Allowance) indicates no impact to the subject site.

A SFRA map extract is included within Appendix H.

The overall risk of from Fluvial Flooding is considered 'Negligible / Very Low'.

3.4 Surface Water (Pluvial) Flooding

Surface water (pluvial) flooding is rainfall generated overland flow prior to runoff entering a watercourse or sewer. Actual flooding may be a result of either overwhelming of sewerage and drainage systems during extreme events; or less extreme rainfall events over lower permeability ground. In such circumstances, overland flow and ponding may occur in topographic depressions.

The Environment Agency on-line Long Term Flood Risk mapping (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>) indicates no Surface Water Flood Risk across the subject site for 'High', 'Medium' or 'Low' flood risk scenarios⁵.

EA map extract depicting the 'Low' risk scenario is included within Appendix I.

The London Borough of Richmond upon Thames SFRA (2016) includes data from the EA Updated Flood Map for Surface Water database (uFMfSW). The SFRA presents maps for the 1 in 100 (1%) AEP, which depicts potential flood water depth. No impact is shown across the subject site.

The London Borough of Richmond upon Thames SWMP (2011) also presents Surface Water Flood Risk Mapping for the 1 in 100 (1%) AEP event. The map indicates no flood risk at the subject site.

Overall, the potential Surface Water (Pluvial) Flood risk is considered to be 'Negligible'.

It is however noted that as the FFL for the proposed building will be below the current ground elevation. The ground adjacent to the building will therefore be sloped at a proposed gradient of 1:20 for access purposes (as stated within Section 2 of this report). Surface water generated by the constructed slope will be managed by the inclusion of appropriately sized threshold drains adjacent to the building. A Surface Water Drainage Strategy is recommended to detail the drainage design.

3.5 Sewer Flooding

The Richmond upon Thames SFRA (2016) includes a map extract from the Thames Water Utilities Limited DG5 Flood Register. The map shows the number of properties impacted by sewer flooding within areas based on a 4-digit postcode basis. The subject site is within an area with '6 - 10' properties impacted; which is relatively low. There is no reason to suggest the subject site has been impacted by sewer flooding.

⁵ 'High' risk scenario (greater than 3.3% in any given year); 'Medium' risk scenario (between 1 in 100 [1%] and 1 in 30 [3.3%] in any given year), and 'Low' risk scenario (between 1 in 1,000 [0.1%] and 1 in 100 [1%] in any given year).

3.6 Groundwater Flooding

The Richmond SFRA (2016) states that evidence of Groundwater Flooding within the Borough is relatively limited. The SFRA states that there is a possibility of groundwater flooding where variable permeability 'Thames Gravels' (such as the Kempton Gravel Member) are present over low permeability London Clay; which is the case for the subject site. The SFRA references the Richmond Surface Water Management Plan (SWMP, 2011) for further detail regarding historic groundwater flooding incidents.

Mapping within both the Richmond Local Flood Risk Management Strategy (LFRMS) and SWMP indicate no flood incidents within close proximity to the subject site (based partly on EA records). The SWMP also indicates the site to be within an area with an 'Increased Potential for Elevated Groundwater' (within permeable Superficial Deposits).

It could therefore be suggested that the site is within an area with a '**Moderate Risk**' of **Groundwater Flooding**; where a 'Moderate Risk' typically means that as a consequence of a 1 in 100 year groundwater flood event; groundwater levels may impact basements; but that properties without basements would not be considered at risk.

Overall, as the development proposal does not include a basement level, the site could be considered at 'Low' risk of potential Groundwater Flooding.

3.7 Flooding from Artificial Sources

With reference to the Environment Agency Long Term Risk of Flooding website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>. The subject site is not indicated to be at risk of Reservoir Flooding.

3.8 Critical Drainage Areas

Critical Drainage Areas (CDAs) are 'discrete geographical areas where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river, and/or tidal) cause flooding in one or more Local Flood Risk Zones (LFRZ) during severe weather which can impact people property or local infrastructure'.

The Richmond upon Thames Surface Water Management Plan (SWMP, 2011) confirms that the subject site is *not* located within a CDA.

3.9 Climate Change

Climate Change will potentially increase both the frequency and intensity of localised storms, which could heighten localised drainage problems. In general, the impacts of climate change should be assessed over the lifetime of a proposed development; and calculated in accordance with the National Planning Policy Framework (NPPF). The Technical Guidance to the NPPF previously recommended national precautionary sensitivity ranges for peak rainfall intensities and peak river flows for use in the assessment of the impacts of climate change on flooding⁶. The previous national sensitivity allowances were updated on 19th February 2016 with new guidance from the Environment Agency. The new guidance replaced the former single national allowance with a range of allowances to assess fluvial flooding. The new allowances for use in flood risk assessment are varied based on

⁶ Table 5 of the Technical Guidance to the NPPF national precautionary sensitivity ranges for peak rainfall intensities: +5% (1990 – 2025); +10% (2025 – 2055); +20% (2055 – 2085) and +30% (2085 – 2115)

individual river basin districts; and subsequently refined based on the vulnerability classification of the development; the flood zone classification; and the lifetime of the development.

Climate Change is incorporated into the datasets referenced in the determination of Tidal, Fluvial, and Surface Water (Pluvial) Flooding presented within Sections 3.3 and 3.4.

Climate Change is not considered likely to significantly alter the potential impact from Groundwater Flooding; which is considered to be 'Low', as the proposed development plans do not include a basement level.

4 Summary and Conclusion

4.1 FRA Summary Points

- Environment Agency flood zone mapping indicates “The site” at ‘**Barnes Primary School, Cross Street, London, SW13 0QQ**’ to be located wholly within **Flood Zone 1** (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding [$<0.1\%$]); but with an area of **Flood Zone 3a** located immediately to the east. Flood Zone 3 is classified as land assessed as having a 1 in 100 or greater annual probability of river flooding ($>1\%$), or a 1 in 200 or greater annual probability of flooding from the sea ($>0.5\%$) in any year.
- In recognition of the flood risk setting for the site, a **Level 2 Flood Risk Assessment (FRA): Scoping Study** was conducted.
- **The Environment Agency (EA) Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating indicates the maximum risk of flooding to be a ‘Negligible’. An area of ‘Very Low’ risk of flooding (less than 1 in 1,000 [$<0.1\%$] in any given year) is indicated adjacent east of the site; and corresponds with the Flood Zone 2 / 3 delineation.**
- The closest watercourse to the site is a culverted drain beneath the existing Barnes Primary School approximately 60m east of the site (referenced as part of the Beverley Brook). The drain commences at the Beverley Brook approximately 110m south-east of the site and flows north-west, entering the River Thames approximately 350m north-west of the site. The Beverley Brook is classified by the Environment Agency as a Main River.
- The EA database of historic flooding events dating back to 1947 confirms no fluvial flood events at the subject site. The SFRA (2016) indicates no events or incidents indicated in the vicinity of the subject site from river, surface water, or groundwater sources.
- Ground elevations indicate the site to be broadly flat, with an elevation of 6.63mAOD within the western site section (*front garden of the existing house*), and 6.59mAOD within the eastern site section (rear garden). A grassed section within the rear garden (adjacent to the eastern perimeter) has a slightly lower elevation of 6.46mAOD. The site elevation is broadly the same as the pavement adjacent to western site perimeter, which is indicated to be 6.59mAOD; falling to 6.47mAOD in Cross Street.
- Published British Geological Survey (BGS) records indicate that the bedrock beneath the whole site is the London Clay Formation (comprising clay and silt); overlain by Superficial Alluvium Deposits of the Kempton Park Gravel Member (comprising sand and gravel).
- **In response to an EA Product 4 and 8 Data Request, the EA provided Tidal Modelling data from The Thames Tidal Upriver Breach Inundation Modelling Study (2017).** As the site is located upstream of the Thames Barrier, there is no return period for the modelled flood levels (as levels are controlled by closure of the

barrier). The flood levels generated are therefore referred to as Maximum Likely Water Levels (MLWLs). The epochs modelled were 2014 and 2100; which included an allowance for climate change for the 2100 epoch. The model was used to generate Flood Elevations (i.e. MLWLs) at multiple Node Points along Beverley Brook approximately 65m south-east of the site.

For the 2014 epoch, the MLWLs for all Node Points is stated as 'Nil Return'; with MLWLs for the 2100 epoch stated as between 4.82mAOD and 4.86mAOD. **The Flood Extent mapping for both epochs indicates no flood impact at the subject site.**

It is noted that the RoFRaS Flood Rating for the site is 'Negligible' (based on a breach or overtopping of existing defences). In addition, the site is afforded protection by the Thames Barrier.

Fluvial Flood Hazard Mapping: The London Borough of Richmond upon Thames SFRA (2016) includes Fluvial Flood Hazard Mapping of the Beverley Brook. Maps showing the flood extent of the 1 in 100 (1%) AEP (plus Climate Change Allowance) indicates no impact to the subject site.

The overall risk of Tidal or Fluvial Flooding is considered 'Negligible / Very Low'.

- **Surface Water (Pluvial) Flooding:** The EA on-line Long Term Flood Risk mapping (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>) indicates no Surface Water Flood Risk across the subject site for 'High', 'Medium' or 'Low' flood risk scenarios.

The Richmond SFRA (2016) includes data from the EA Updated Flood Map for Surface Water database (uFMfSW). The map for the 1 in 100 (1%) AEP depicts potential flood water depth. No impact is shown across the subject site.

The Richmond SWMP (2011) presents Surface Water Flood Risk Mapping for the 1 in 100 (1%) AEP event; and indicates no flood risk at the subject site.

Overall, the potential Surface Water (Pluvial) Flood risk is considered to be 'Negligible'.

- **Groundwater Flooding:** Both the Richmond Local Flood Risk Management Strategy (LFRMS) and SWMP indicate no flooding incidents in proximity to the site.

The SWMP also indicates the site is within an area with an 'Increased Potential for Elevated Groundwater' (within permeable Superficial Deposits). It could therefore be suggested that the site is within an area with a **'Moderate Risk' of Groundwater Flooding**; where a 'Moderate Risk' typically means groundwater levels may impact basements as a consequence of a 1 in 100 year groundwater flood event; but that properties without basements would not be considered at risk.

Overall, as the development proposal does not include a basement level, the site could be considered at 'Low' risk of potential Groundwater Flooding.

- With reference to the EA Long Term Risk of Flooding website, **the subject site is not indicated to be at risk of Reservoir Flooding.**

- **The site is *not* located within a Critical Drainage Area (CDA).**
- At the time of preparing this Flood Risk Assessment (FRA), development plans comprised:
 - **Demolition of the existing 2 storey residential house.**
 - **Construction of a 2 storey Educational Building:**

The potential educational development would be classified within the NPPF as a 'More Vulnerable' development; which is considered appropriate within Flood Zones 1, 2, and 3a.

It is understood that Richmond upon Thames Planning Department has requested the Finished Floor Level (FFL) to be 6.35mAOD.

(It is noted that the proposed FFL is approximately 0.24m below the existing ground elevation, which is generally within the range 6.59mAOD to 6.63mAOD).

- A Surface Water Drainage Strategy is recommended. (It is noted that the proposed design would accommodate the requested FFL by sloping the external ground level to the new building at 1:20 towards the building; with surface water collected within Threshold Drains).

4.2 Mitigation Measures

In considering flood Mitigation Measures appropriate to the site; all potential sources of flood risk have been evaluated. In summary, the potential flood risk is as follows:

- **Tidal Flood Risk:** 'Negligible / Very Low'.
- **Fluvial Flood Risk:** No impact.
- **Surface Water (Pluvial) Flood Risk:** 'Negligible'.
- **Groundwater Flood Risk:** 'Low' (as the proposal has no basement level).

4.2.1 Finished Floor Levels (FFLs)

The site is wholly located within Flood Zone 1. A guidance recommendation for the setting of FFLs is not stated within the EA document: 'Flood Risk Assessment in Flood Zone 1 and Critical Drainage Areas'.

The proposed FFL elevation of 6.35mAOD (0.24m below the existing ground elevation of range 6.59mAOD to 6.63mAOD) would therefore be deemed acceptable so long as access to the building is protected from the potential ingress of Surface Water generated by the proposed 1:20 slope constructed towards the new building.

The proposed design plans (Section 2) confirms that appropriately sized Threshold Drains would be constructed along the access perimeter of the building to manage surface water generated by the proposed 1:20 slope towards the building. On this basis the proposed FFL elevation of 6.35mAOD would be acceptable.

4.2.2 Surface Water Management

A Surface Water Management Strategy would be required to accompany the design plans.

4.2.3 Advisory Note

In view of the proposed FFL of 6.35mAOD being approximately 0.24m below the existing ground level; and the potential 'Low' risk of potential groundwater Flooding; it is advised that consideration be given to the following flood resistance and resilience measures to enhance the flood protection to the building:

- Use of Flood Resistant Doors for external access to the building.
- Raising of all internal electrical wiring 0.3m above the Finished Floor Level.

4.3 **Concluding Comments**

- The proposed development is considered appropriate in Flood Zone 1.
- The Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) database indicates a 'Negligible / Very Low' risk.
- The potential risk from Tidal, Fluvial, and Surface Water Flooding is 'Negligible'.
- The potential risk from Groundwater Flooding is 'Low'.
- The proposed Finished Floor Level (FFL) is 6.35mAOD.
- In the event that Development Plans are changed this FRA should be reviewed accordingly.

5 Closure

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside the stated scope of the research. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by agb Environmental Ltd.

The 'vicinity' of the site for the purposes of the report, is defined as locations situated within an approximate 250m radius of the site, although certain sources of contamination and/or sensitive targets further than 250m of site have also been included. Advice provided within this report is based on current guidelines available at the time of writing. This report is subject to amendment in light of additional information becoming available or statutory consultee review, including the Environment Agency and Local Council.

This report is written in the context of an agreed scope of work between agb Environmental Ltd and the Client and should only be used in this specific context. Re-interpretation of this report in whole or part may become necessary if additional information becomes available or practices or legislation changes.

agb Environmental Ltd does not provide legal advice; the advice of the Client's legal advisors may also be required. agb Environmental Ltd Terms and Conditions apply.

6 References

Department for Communities and Local Government (2018) National Planning Policy Framework.

Department for Communities and Local Government (2012) Technical Guidance to the National Planning Policy Framework.

Environment Agency (2020) Product 4 and Product 8: Detailed FRA / FCA Map centred on 'Barnes Primary School, Cross Street, London, SW13 0QQ' (ref: KSL 184788 AC) (2020).

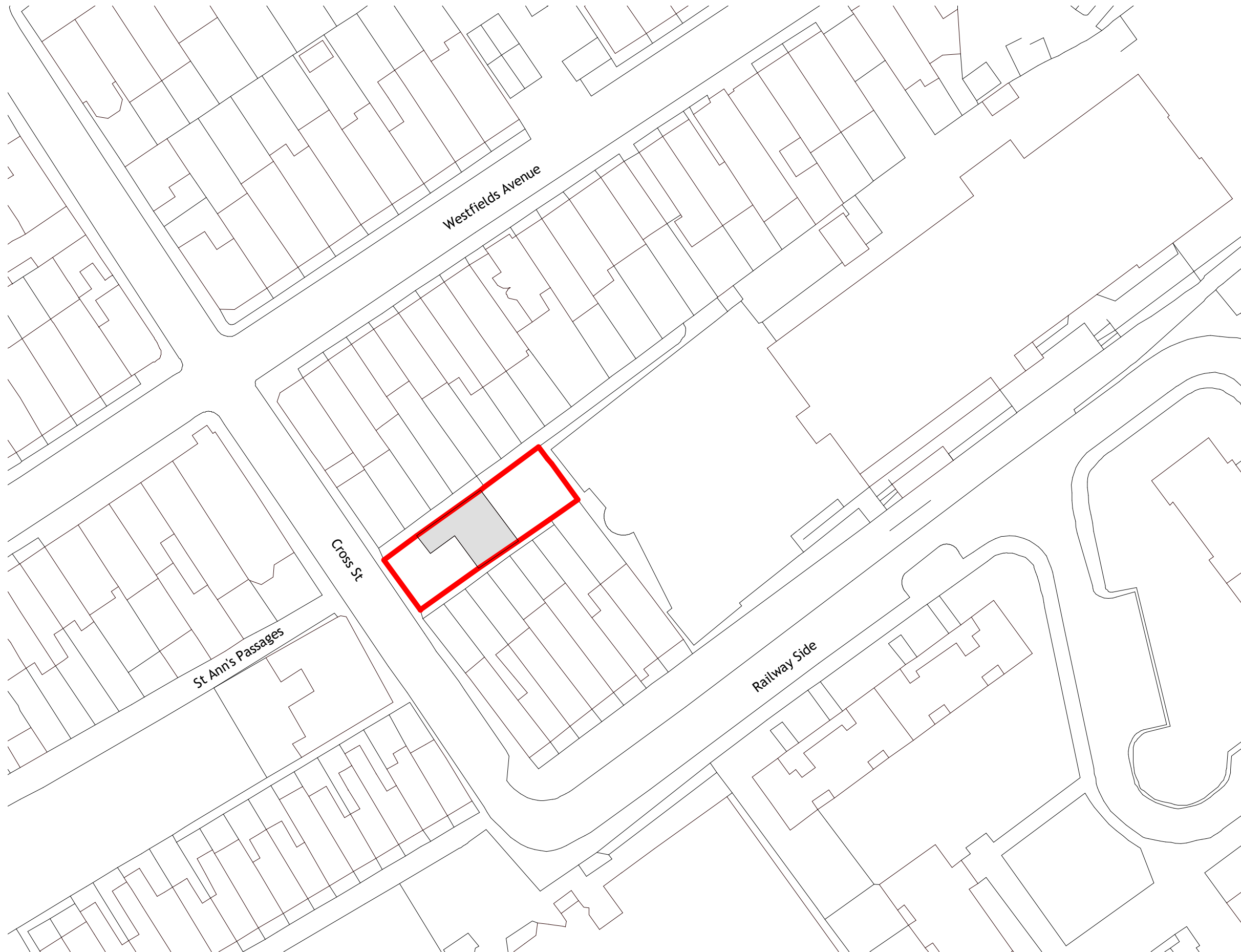
London Borough of Richmond upon Thames (2014) Local Flood Risk Management Strategy (LFRMS) 2014 – 2020.

Metis Consultants (2016) London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) update (March 2016).

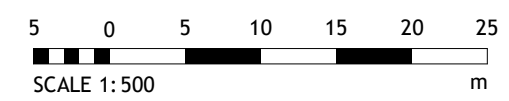
URS / Scott Wilson (2011) London Borough of Richmond upon Thames Preliminary Flood Risk Assessment (PFRA) V05 (May 2011).

URS / Scott Wilson (2011) London Borough of Richmond upon Thames Surface Water Management Plan (SWMP) v0pt2 (September 2011).

APPENDIX A Site Location Map and Current Site Layout



1 Site Location Plan
1 : 500



P1 Issue for Information			20/02/20
Revision	Amendment		Date
TG	LF	-	
Drawn by	Reviewed by	Approved by	
61020	20/02/20	1 : 500 @ A3	
MCB Number	Date Created	Scale of A3	

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Client
LONDON BOROUGH OF RICHMOND UPON THAMES

Project
BARNES PRIMARY SCHOOL

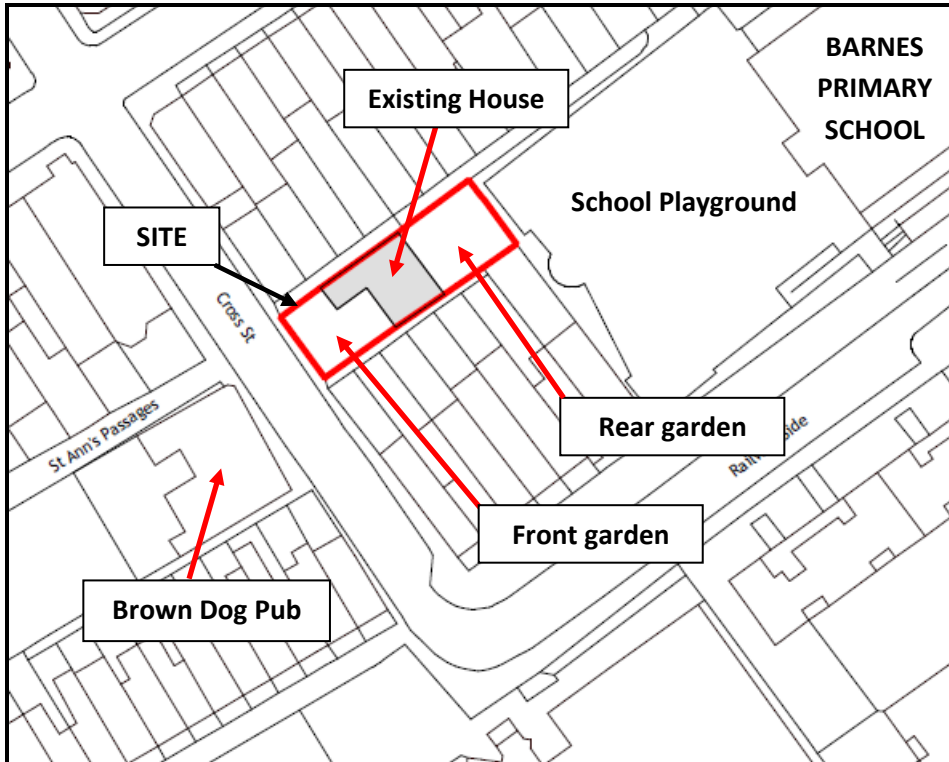
Drawing Title
SITE LOCATION PLAN

ARCHITECTURE

Drawing / Document Reference							Status	
LOND01 - MCB - XX - ZZ - DR - A - 0200							S2 - P1	
Project	Originator	Zone	Level	Type	Discipline	Number	Suitability	Revision

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CURRENT SITE LAYOUT: BARNES PRIMARY SCHOOL, CROSS STREET, LONDON



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THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

APPENDIX B Topographic and Utility Survey



LEGEND

	SURVEY STATION		FOUL DRAINAGE
	LEVEL		SURFACE DRAINAGE
	BUILDING		COMBINED DRAINAGE
	FENCE		ELECTRICITY
	WALL		ELECTRICITY HIGH VOLTAGE
	HEDGE		TRAFFIC SIGNALS
	KERB		WATER
	MANHOLE		CABLE TELEVISION
	VERGE		CLOSE CIRCUIT TELEVISION
	TREE (SHOWN TO SCALE)		BRITISH TELECOM
	TREE GANDY		COMPRESSED AIR
	FOLIAGE		OSM LINE
	FURNITURE		OIL PIPE
	DATE		PIPE
	STEP		FUEL LINE
	LINE MARKINGS		VENTILATION
	SPEED HUMP		VARIOUS RECOVERY
	GULLY RUN		SAUBIE LINE
	DRAINAGE CHANNEL		TELEMETRY
	BANKS		FIRE CABLES
	TRENCH BEAR		UNKNOWN
	CONTOUR MAJOR		OVERHEAD LINE
	CONTOUR MINOR		HISTORICAL BY LAYER
	BOREHOLE		END OF TRADE
	STATION		DO NOT DRILL / BANDED PIPES
	PUMP ISLAND		W WATER
	BOREHOLE		U UNKNOWN
			P PRODUCT
			C CONCRETE

ABBREVIATIONS

AG	AIR CONDITIONER	OH	OVERHEAD
AW	AIR VALVE	OSM	OFF SURVEY AREA
AV	AIR VALVE	OSBM	ORANGE SURVEY BENCH MARK
BOLL	BOLLARD	PS	PIPE RISER
ILLU BOLL	ILLUMINIOUS BOLLARD	PSR	PIPE RISER
BS	BELISHA BENCH	PSR FENCE	PIPE RISER FENCE
BH	BORERHOLE	RET WALL	RETAINING WALL
BS	BUS STOP	RE	ROAD SIGN
BTIC	BRITISH TELECOM COVER	RS	ROAD SIGN
CBX	CABLE BOX	RWP	RAIN WATER PIPE
CR	CABLE RISER	S/A	SEAM AWAY
CTV	CABLE TV	SAP	SEALING
CP	CATCHPIT	S/C	ROUND CONNECTED
DDNC	DEEPENING	SEC FENCE	SECURITY FENCE
CL	CONCRETE	SL	SPOT LIGHT
D	DEPTH / DEEP	SP	SOIL PIPE
D-CHAN	DRAINAGE CHANNEL	ST	STOP SIGN
DR	DOWN PIPE	STN	STATION (DATUM POINT)
ED	EARTH ROD	SV	STATION VALVE
ER	EARTH ROD	SVP	SOIL VENT PIPE
EP	ELECTRICITY POLE	TBM	TEMPORARY BENCH MARK
EOT	END OF TRADE	TDL	TREE GANDY LEVEL
FFL	FINISHED FLOOR LEVEL	TFL	TOP OF FLOOR LEVEL
FIBED	FIBRE OPTIC	TFW	TAKEN FROM RECORDS
FM	FIRE METER	THL	THRESHOLD LEVEL
FS	FIRE SWITCH	TL	TRAFFIC LIGHT
GV	GAS VALVE	TR&R	TRUNK & RAIL
G	GULLY	TR&R	TRUNK & RAIL
G-RUN	GULLY RUN	UTL	UNABLE TO LOCATE
HT	HEDDIT	UTR	UNABLE TO RAISE
IC	INVERTION COVER	UTY	UNABLE TO SURVEY
IL	INVERT LEVEL	UTY	UNABLE TO TRADE
KD	KERB OUTLET	VR	VARIOUS RECOVERY
LP	LETTER BOX	VR	VENT PIPE
LP	LAMP POST	WH	WATER METER
MB	MULTI-ROD	WD	WATER OUT
MH	MANHOLE	WFC	WATER FILLED CHAMBER
MAR	MARKER	WP	WASTE PIPE
MTR	METER	U/S	UNDERSIDE
MP	MONITORING WELL	Ø	DIAMETER

UTILITY NOTES

PASSIVE RADIO AND POWER CHECKS CONDUCTED THROUGHOUT SURVEY AREA.
 DRP SWATHS UNDERTAKEN THROUGHOUT SITE EXTENTS.
 HD CABLE TV INLETS OR COVERS LOCATED WITHIN PROPERTY.
 RADIO SIGNAL TRACED, SHOWING AS AN UNKNOWN ON THE DRAWING, PRESUMED TO BE GAS.
 ONE MANHOLE LOCATED IN FOOTPATH WAS UNABLE TO BE LIFTED DUE TO CAUSING POTENTIAL DAMAGE TO THE SURROUNDING FOOTPATH SURFACE. ASSUMED TO BE STORM WATER GUTTAL.

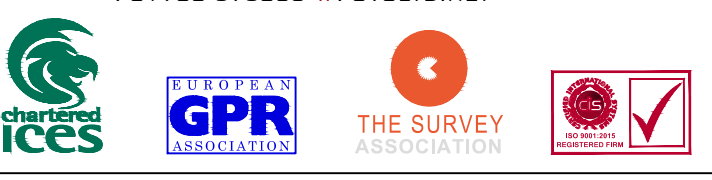
STATION COORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
SVS01	521548.290	175913.519	6.523	ROAD NAIL
SVS02	521551.230	175910.020	6.553	ROAD NAIL
SVS03	521551.159	175915.614	6.569	ROAD NAIL
SVS04	521565.784	175910.715	6.584	ROAD NAIL

TOPOGRAPHICAL NOTES

ALL LEVELS ARE IN METRES RELATED TO OSGB36 DATUM UNLESS OTHERWISE STATED.
 COORDINATE DATA IS RELATED TO OSGB36 DATUM UNLESS OTHERWISE STATED.
 SITE CENTERED AROUND SVS01. NO SCALE FACTOR APPLIED.
 THESE NOTES ARE INDICATED WHERE KNOWN HOWEVER IT IS RECOMMENDED THAT EXPERT IDENTIFICATION IS CONSULTED IF CRITICAL.

REV	DATE	DESCRIPTION



CLIENT:

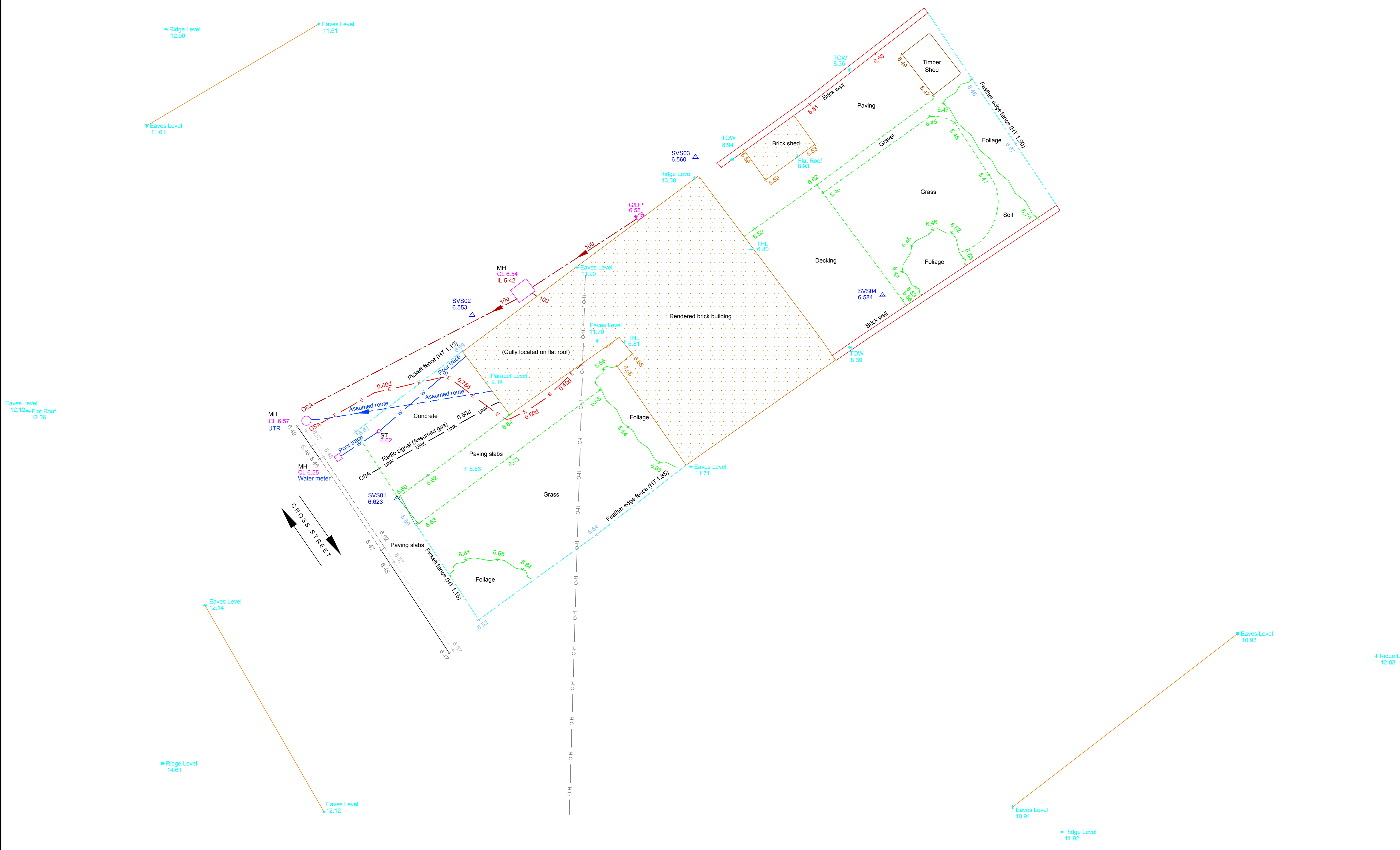
SITE LOCATION: **BARNES SCHOOL
CROSS STREET
SW13 0AP**

DRAWING TITLE: **TOPOGRAPHIC & UTILITY**

SURVEYED BY: **DG** DRAWN BY: **DG** APPROVED BY: **FL**

DRAWING NO: **0720-AGB-13401** SURVEY DATE: **30-07-2020**

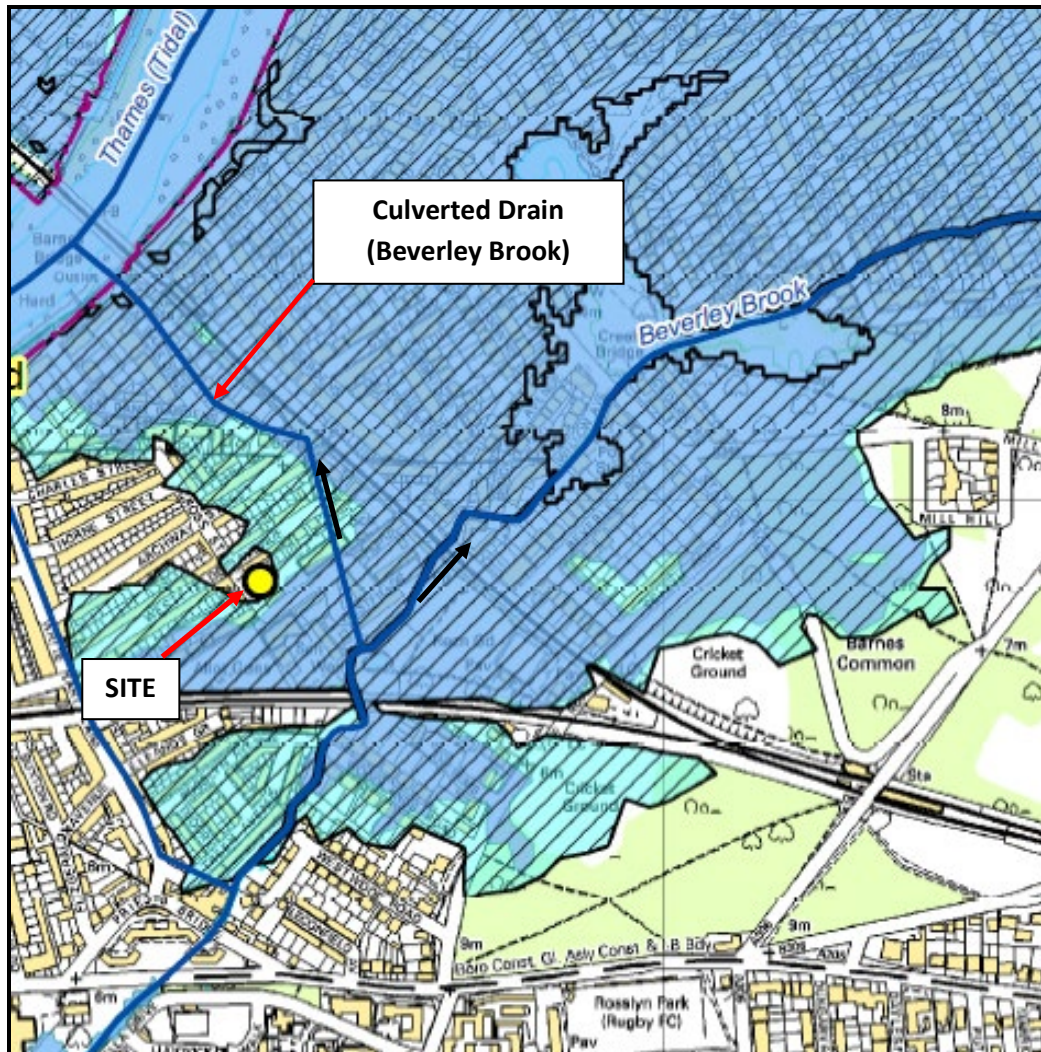
SCALE: **1:100 @A1** SHEET NO: **1 OF 1** REV:



DISCLAIMER: THE LOCATION OF UNDER GROUND SERVICES SHOWN ON THIS DRAWING HAS BEEN DETERMINED USING ELECTRO-MAGNETIC (AND/OR GROUND PROBING RADAR, WHERE REQUESTED) TECHNIQUES AND VISUAL OBSERVATIONS. THE LIMITATIONS OF THIS DRAWING SHOULD BE REALISED AND NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN IDENTIFIED. THIS DRAWING MAY NOT INCLUDE THE LOCATION OF ALL PUBLIC SERVICES THAT MAY CROSS THE SITE AND THEREFORE THE RELEVANT SERVICE DRAWINGS SHOULD BE OBTAINED FROM THE APPROPRIATE UTILITY COMPANY AND USED IN CONJUNCTION WITH THIS DRAWING. ADDITIONAL SERVICES, STRUCTURES OR OTHER BELOW GROUND OBSTRUCTIONS NOT INDICATED ON THIS DRAWING MAY BE PRESENT ON SITE. REFERENCE SHOULD BE MADE TO HISTORICAL PLANS AND AS BUILT DRAWINGS. EXCAVATIONS IN THE VICINITY OF SERVICES SHOULD BE CARRIED OUT WITH DUE DILIGENCE REF: HSG47 DOCUMENT 'AVOIDING DANGERS FROM UNDERGROUND SERVICES'. LOCATION ACCURACY IS DETERMINED BY REFERRING TO MANUFACTURERS GUIDELINES FOR THE SYSTEMS DEPLOYED. REFERENCE SHOULD BE MADE TO THE LATEST VERSION OF SVS LTD SITE PROCEDURES DOCUMENT FOR UTILITY LOCATION SURVEYS.

APPENDIX C Surface Water Features Map




SURFACE WATER FEATURES MAP



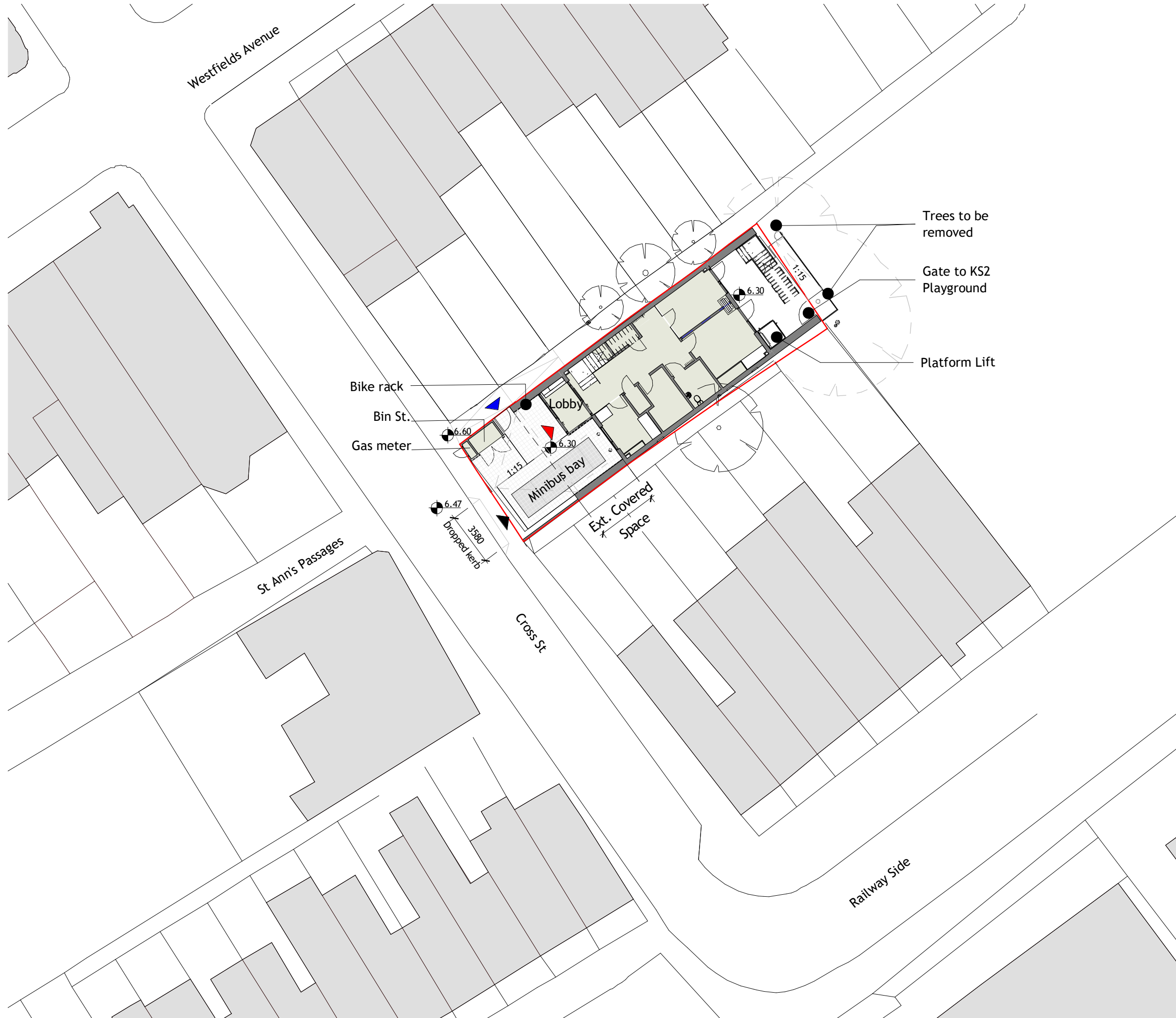
Source: [Open Government Licence](#)

Key: THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

↗ = Flow Direction

-  Areas Benefitting from Flood Defences
-  Flood Map - Flood Zone 3
-  Flood Map - Flood Zone 2

APPENDIX D Development Plans



- ▲ Vehicular access
- ▲ Pedestrian access
- ▲ Entrance
- Site Boundary

1 Site Layout
1 : 250



P2	Issue for comments	16/09/20
P1	Issue for coordination	13/07/20
Revision	Amendment	Date
LF	AK	MB
Drawn by	Reviewed by	Approved by
61020	02/23/20	1 : 250 @ A3
WCB Number	Date Created	Scale of A1

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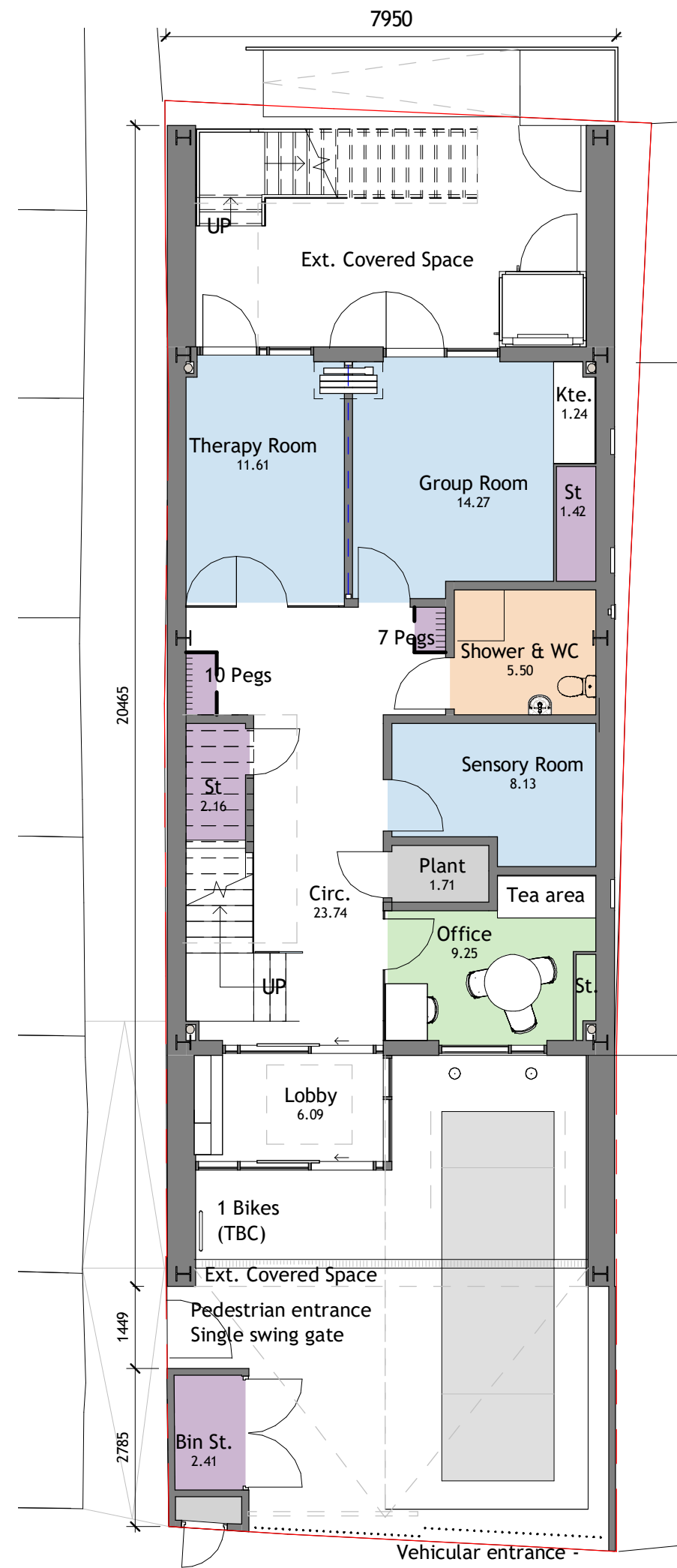
Client
 LONDON BOROUGH OF RICHMOND UPON THAMES

Project
 BARNES PRIMARY SCHOOL
 32 CROSS STREET
 BARNES, LONDON, SW13 0QQ

Drawing Title
 PROPOSED SITE LAYOUT

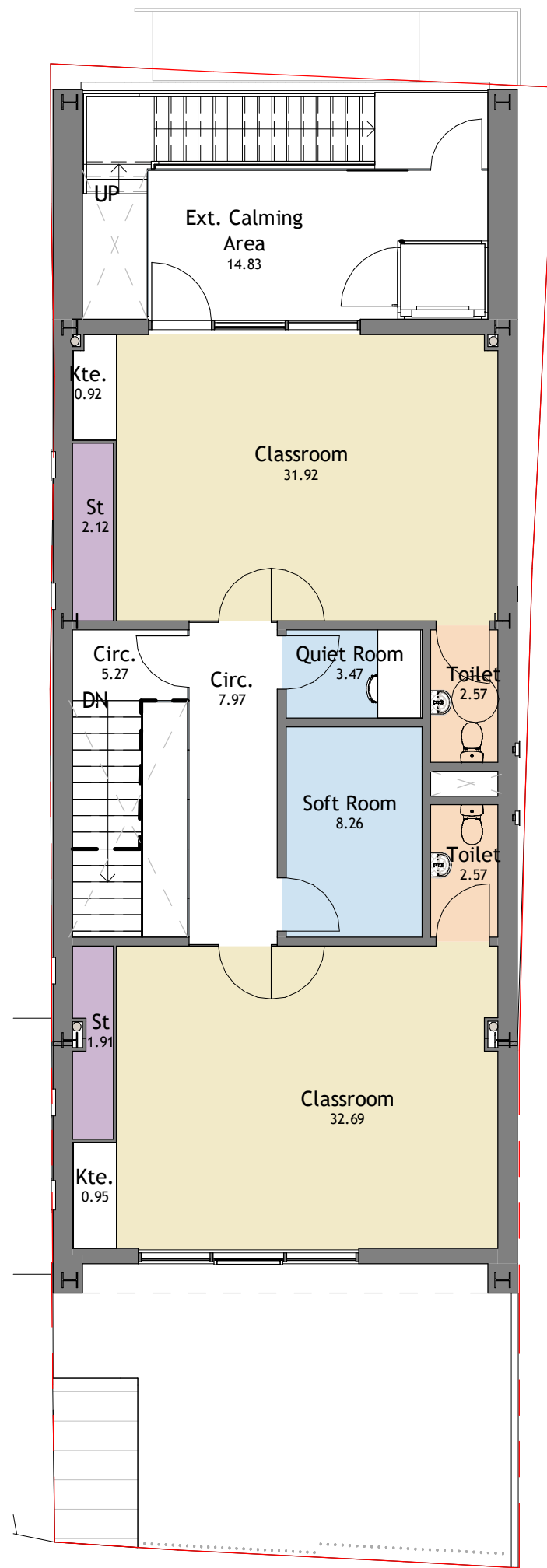
ARCHITECTURE					
Drawing / Document Reference					
LOND01 - MCB - XX - 00 - DR - A - 210					Status
Project Idn	Originator	Zone	Level	Type	Discipline
					Number
					Suitability
					Revision
					S3 - P2

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1 Ground Floor Plan

1 : 100



2 First Floor Plan

1 : 100

— Site Boundary

Revision		Issue for comments		Amendment		16/09/20	
Revision	Issue for comments	Amendment	Amendment	Amendment	Amendment	Amendment	Date
TW		LF		AK			
Drawn by		Reviewed by		Approved by			
61020		16/09/20		As indicated @ A3			
MCE Number		Date Created		Scale of A3			

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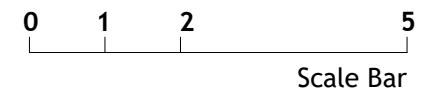
Project
BARNES PRIMARY SCHOOL
32 CROSS STREET
BARNES, LONDON, SW13 0QQ

Drawing Title
PROPOSED GROUND AND FIRST FLOOR PLANS

ARCHITECTURE

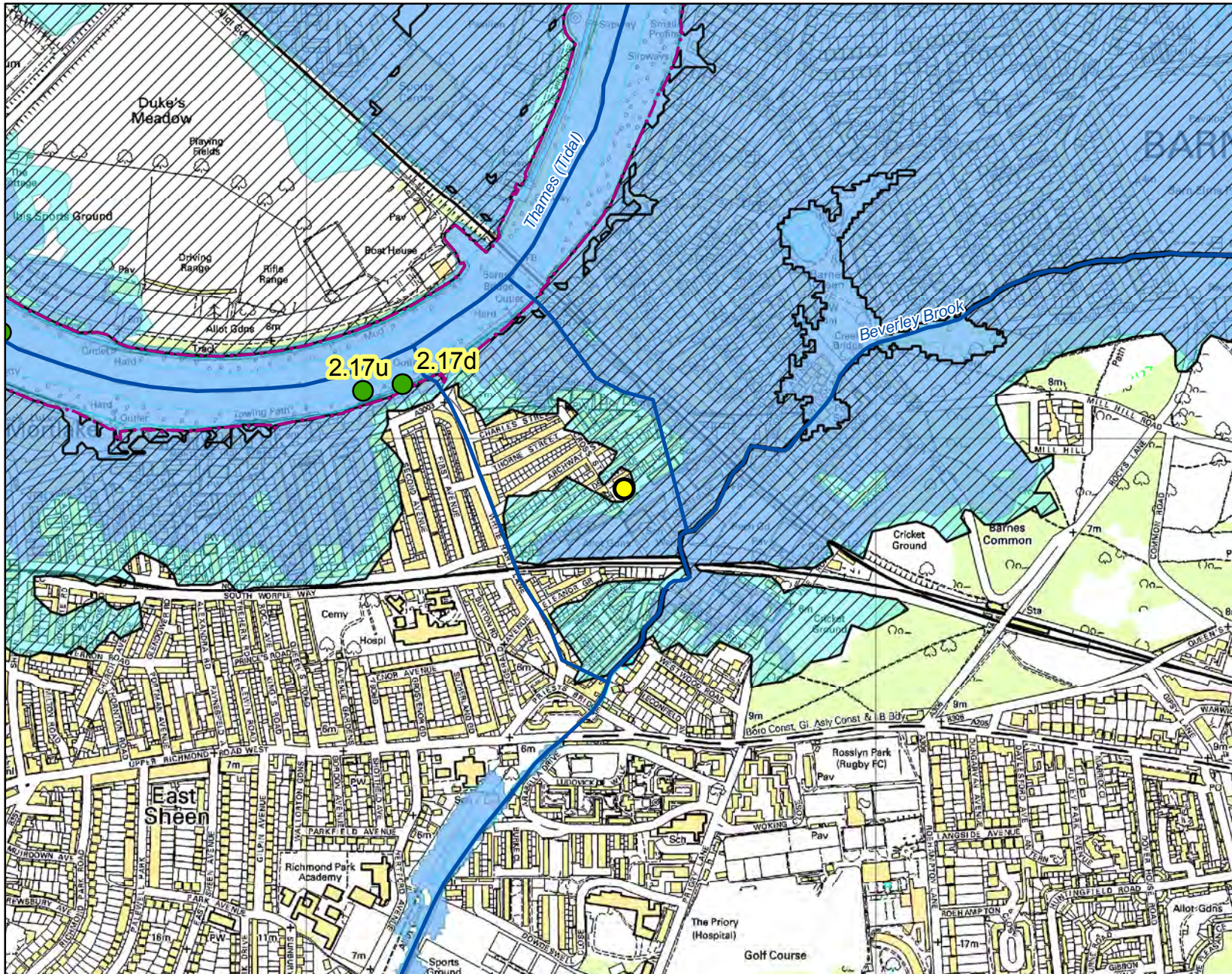
Drawing / Document Reference						Status	
Project Idn	Originator	Zone	Level	Type	Discipline	Number	Subsidiary
LOND01	MCB	XX	ZZ	DR	A	0110	S3 - P1

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APPENDIX E Flood Zone Map (EA map extracts)

Detailed FRA Map centred on SW13 0QQ created 22/09/2020 [Ref: KSL 184788 AC]



Scale 1: 10,000



Legend

- Main Rivers
- Site
- TE2100 Model Nodes
- Flood Map - Defences
- Flood Map - Flood Storage Areas
- Areas Benefiting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

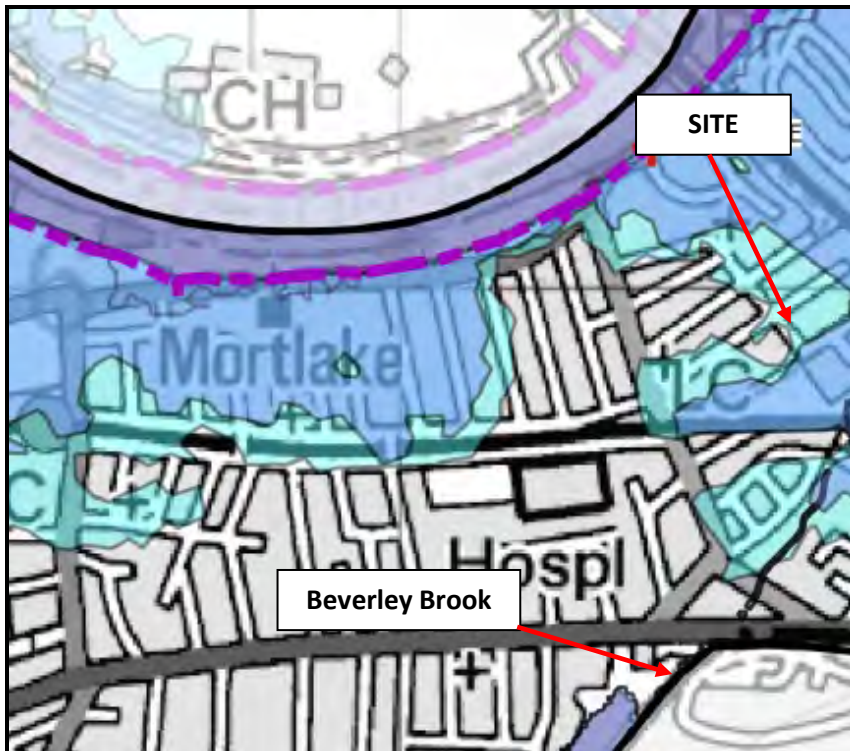
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

FLOOD ZONE MAPPING

The map is presented to illustrate that land adjacent east of the site is not Flood Zone 3b (The Functional Floodplain).

It is noted that the area of Flood Zone 2 to the east of the site is indicated on current EA Mapping as Flood Zone 3 (area benefitting from flood defences).



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THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

Key:

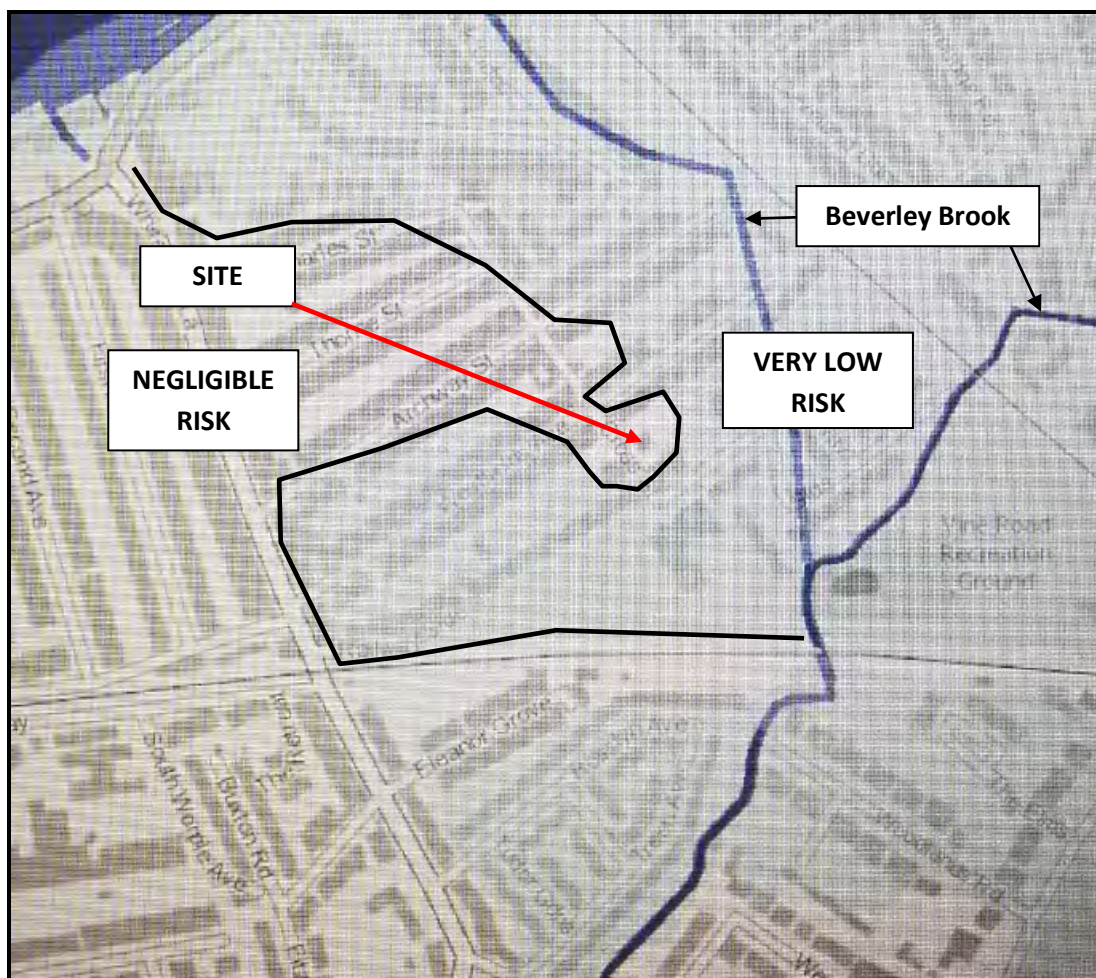
-  Flood Defences
-  Flood Zone 3b
-  Flood Zone 3a
-  Flood Zone 2

Figure reproduced from Metis Consultants (2016) London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) update (March 2016).

RISK OF FLOODING FROM RIVERS AND THE SEA (RoFRaS)

The Environment Agency / Natural Resources Wales 'Risk of Flooding from Rivers and the Sea (RoFRaS) database' [Risk of Flooding from Rivers and Sea](#) generates an indication of river and coastal flood risk based on a 50m grid. The database considers the probability that any flood defences (if present) will overtop or breach, and the distance from the river or sea.

The maximum RoFRaS Flood Rating for the whole site indicates a 'Negligible' risk of flooding. An area of 'Very Low' risk of flooding (less than 1 in 1,000 [$<0.1\%$] in any given year) is indicated adjacent east of the site; and corresponds with the Flood Zone 2 / 3 delineation.

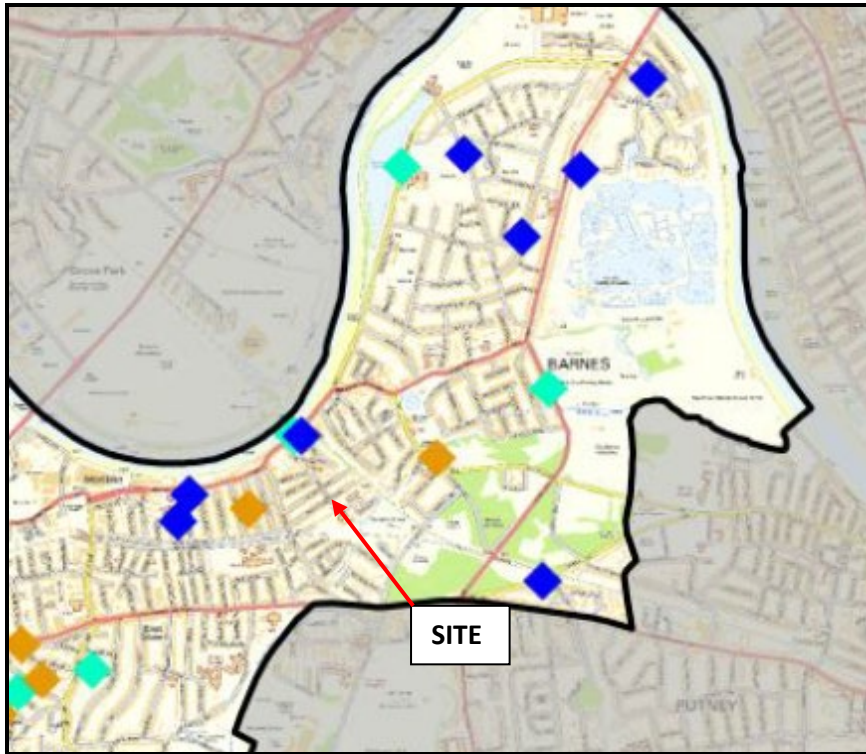


THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

Very Low	Low	Medium	High
The chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.	The chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.	The chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.	The chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

APPENDIX F Historic Flooding (SFRA map extract)

HISTORIC FLOODING



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Key:

Reported Flooding Incidents

- ◆ River
- ◆ Multiple
- ◆ Surface Water
- ◆ Groundwater

□ Administrative Boundary

Source: Metis Consultants (2016) London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) update (March 2016).

APPENDIX G Thames Tidal Upriver Breach Inundation Modelling (EA)

Thames Tidal Upriver Breach Inundation Modelling - 2017

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

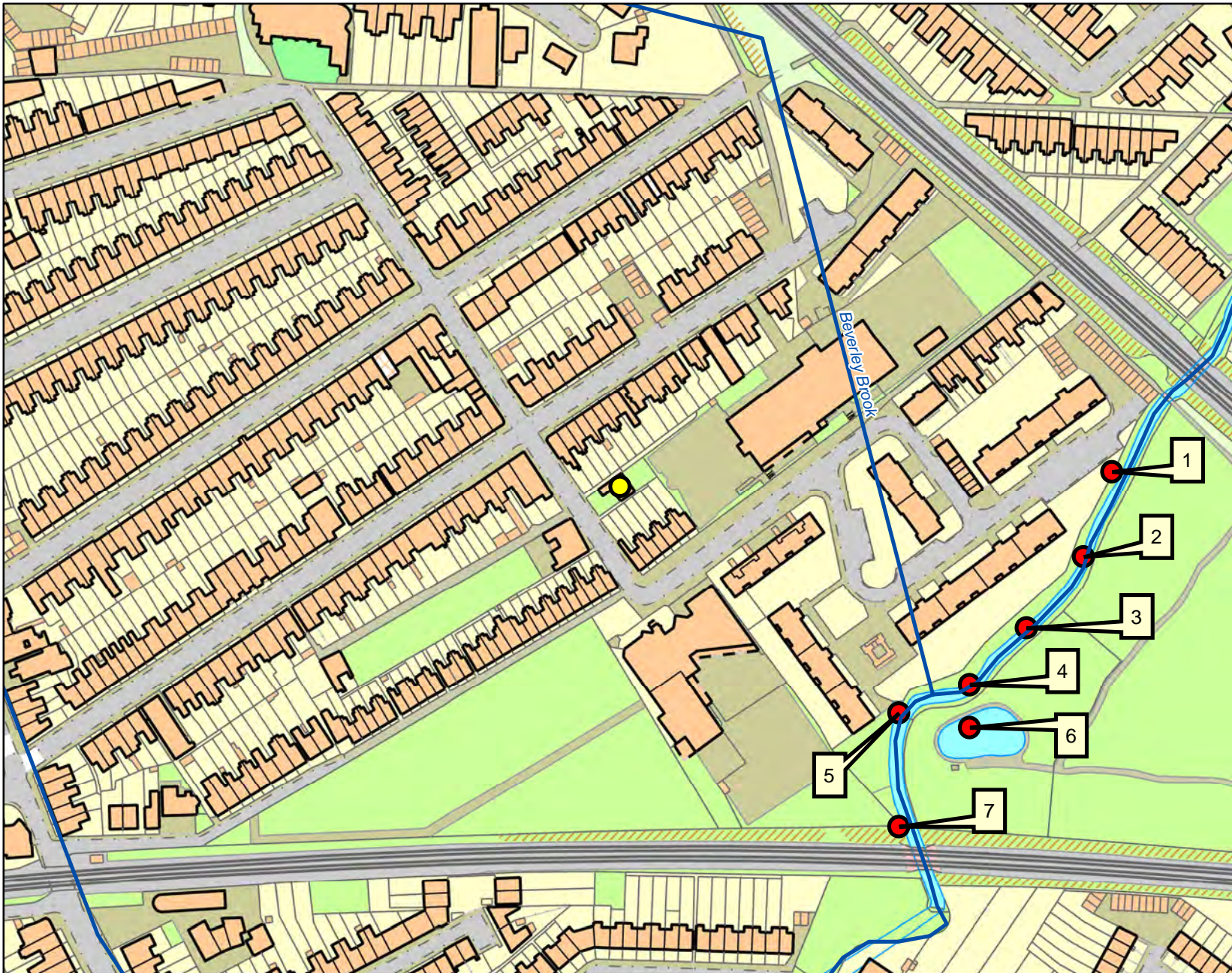
We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard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

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2014 and 2100 epochs were modelled on that basis.

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within London.

Node	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
	Easting	Northing	2014	2100
1	521732	175915	Nil return	Nil return
2	521722	175885	Nil return	4.86
3	521702	175860	Nil return	4.85
4	521682	175840	Nil return	4.85
5	521657	175830	Nil return	4.82
6	521682	175825	Nil return	4.85
7	521657	175790	Nil return	Nil return




2D Node Location Map centred on SW13 0QQ created 22/09/2020 [Ref: KSL 184788 AC]



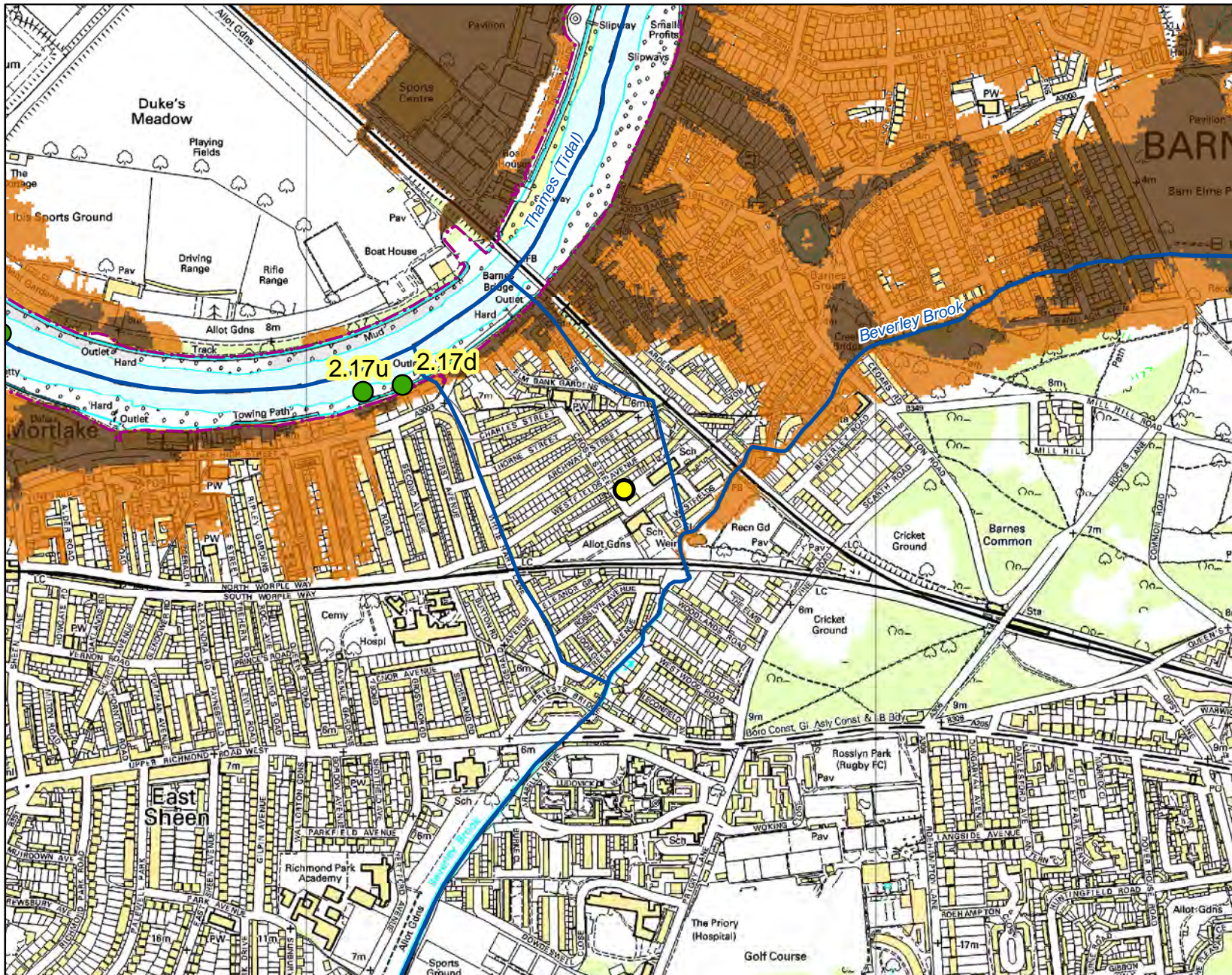
Scale 1: 2,000



Legend

-  Main Rivers
-  Site
-  2D_Nodes

Breach Inundation Modelling Map centred on SW13 0QQ created 22/09/2020 [Ref: KSL 184788 AC]



Scale 1: 10,000



Legend

- Main Rivers
- Site
- TE2100 Model Nodes
- - - Flood Map - Defences

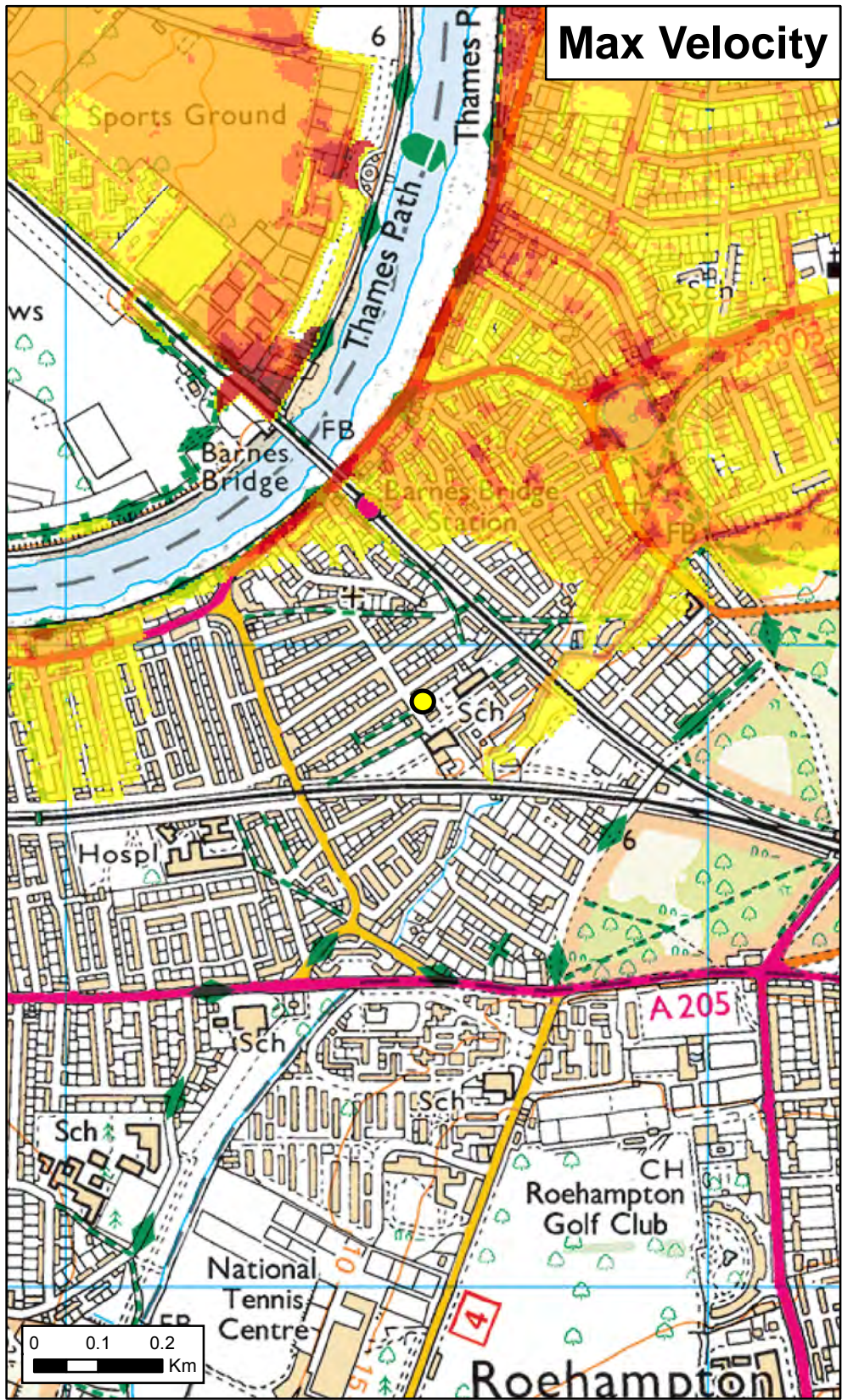
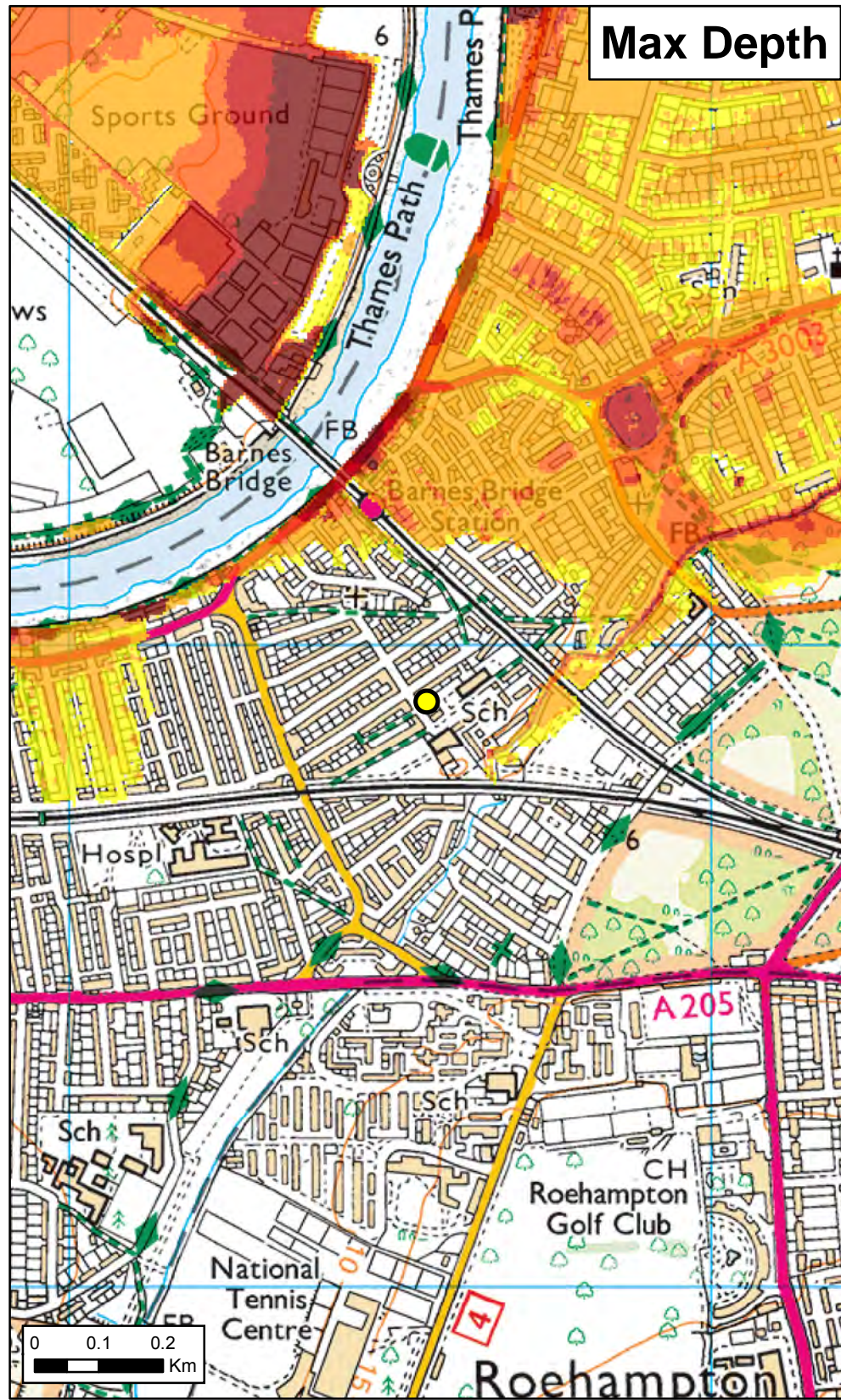
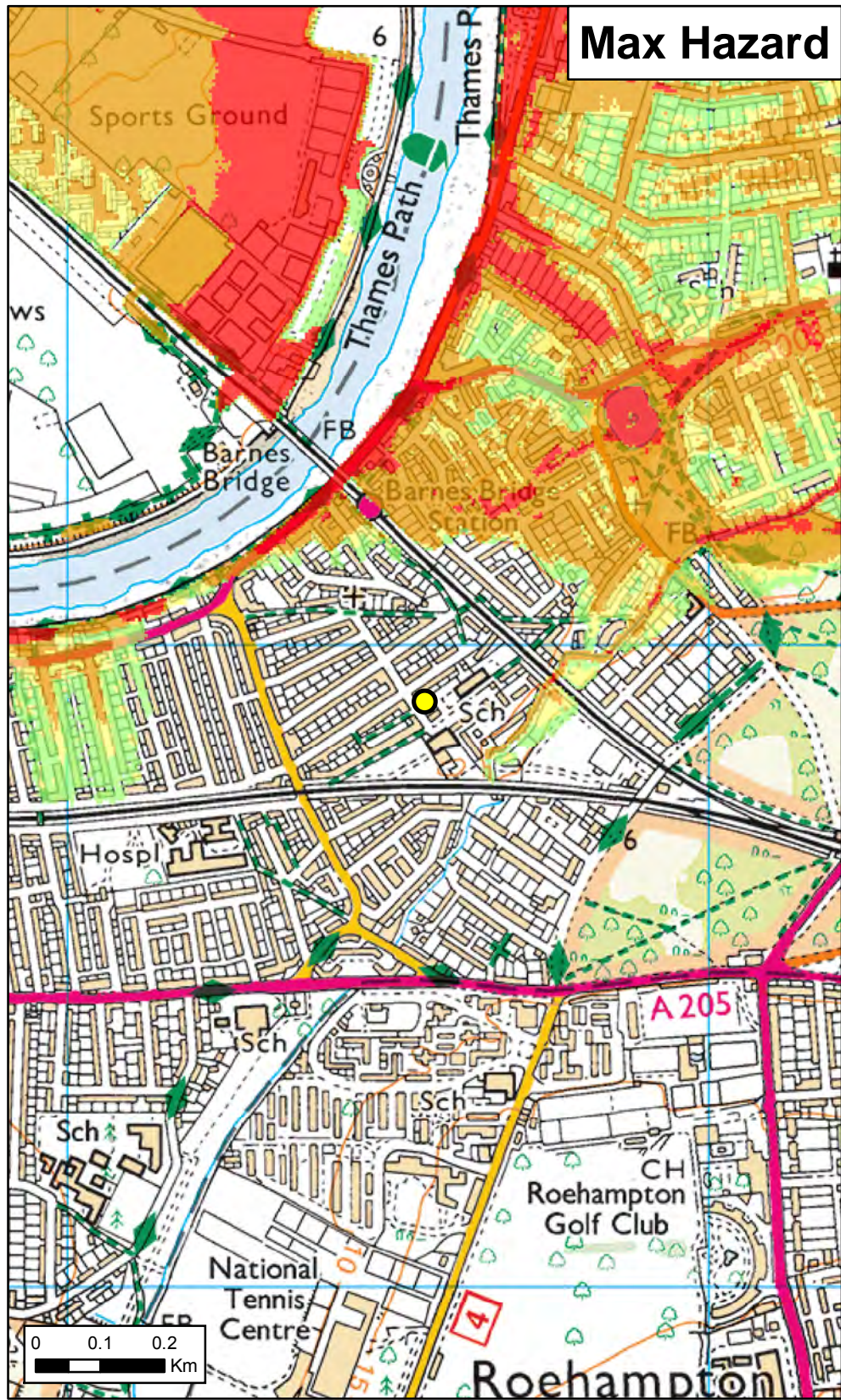
Upriver MLWL Breach Inundation

Epoch

- 2014
- 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

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



● Site					
Max Hazard		Max Depth (m)		Max Velocity (m/s)	
	Less than 0.75 (Low Hazard)		0 - 0.25		0 - 0.3
	Between 0.75 and 1.25 (Danger for Some)		0.25 - 1.00		0.3 - 1.0
	Between 1.25 and 2.00 (Danger for Most)		1.00 - 1.50		1.0 - 1.5
	Greater than 2.00 (Danger for All)		1.50 - 2.00		1.5 - 2.5
			> 2.00		> 2.5
Date Printed	22/09/2020	Scenario year	2100	Scenario Annual Chance	MLWL

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

The map is based on computer modelling of simulated breaches covering the entire extent between Teddington Weir and the Thames Barrier. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

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

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

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



Thames Tidal Breach Hazard Mapping

Map Centred on SW13 0QQ
KSL 184788 AC

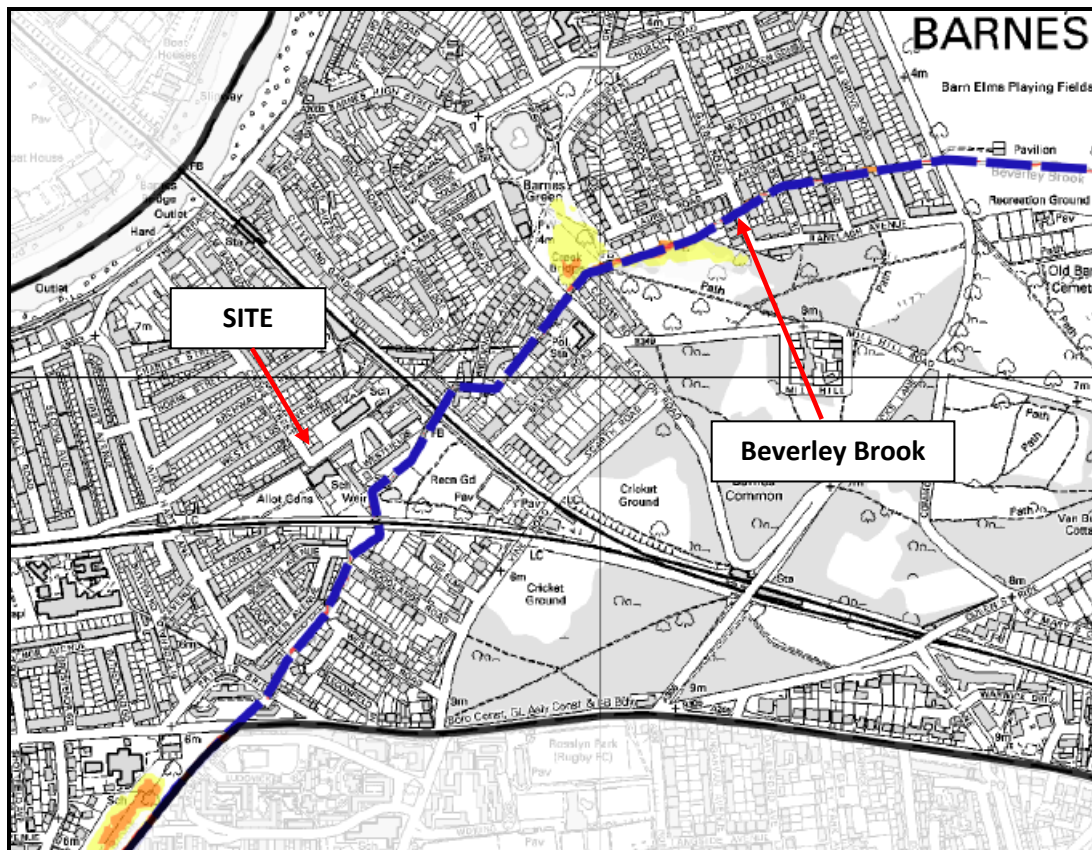
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APPENDIX H Fluvial Flood Hazard Mapping (SFRA map extract)

FLUVIAL FLOOD HAZARD

The London Borough of Richmond upon Thames SFRA (2016) includes Fluvial Flood Hazard Mapping for the Beverley Brook.

The following maps showing the flood extent of the 1 in 100 (1%) AEP (plus Climate Change Allowance) indicates no impact to the subject site.



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THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

Key:

□ Borough Boundary

— Beverley Brook

Hazard Rating

□ Low

□ Moderate

□ Significant

□ Extreme

Figure reproduced from Metis Consultants (2016) London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA) update (March 2016).

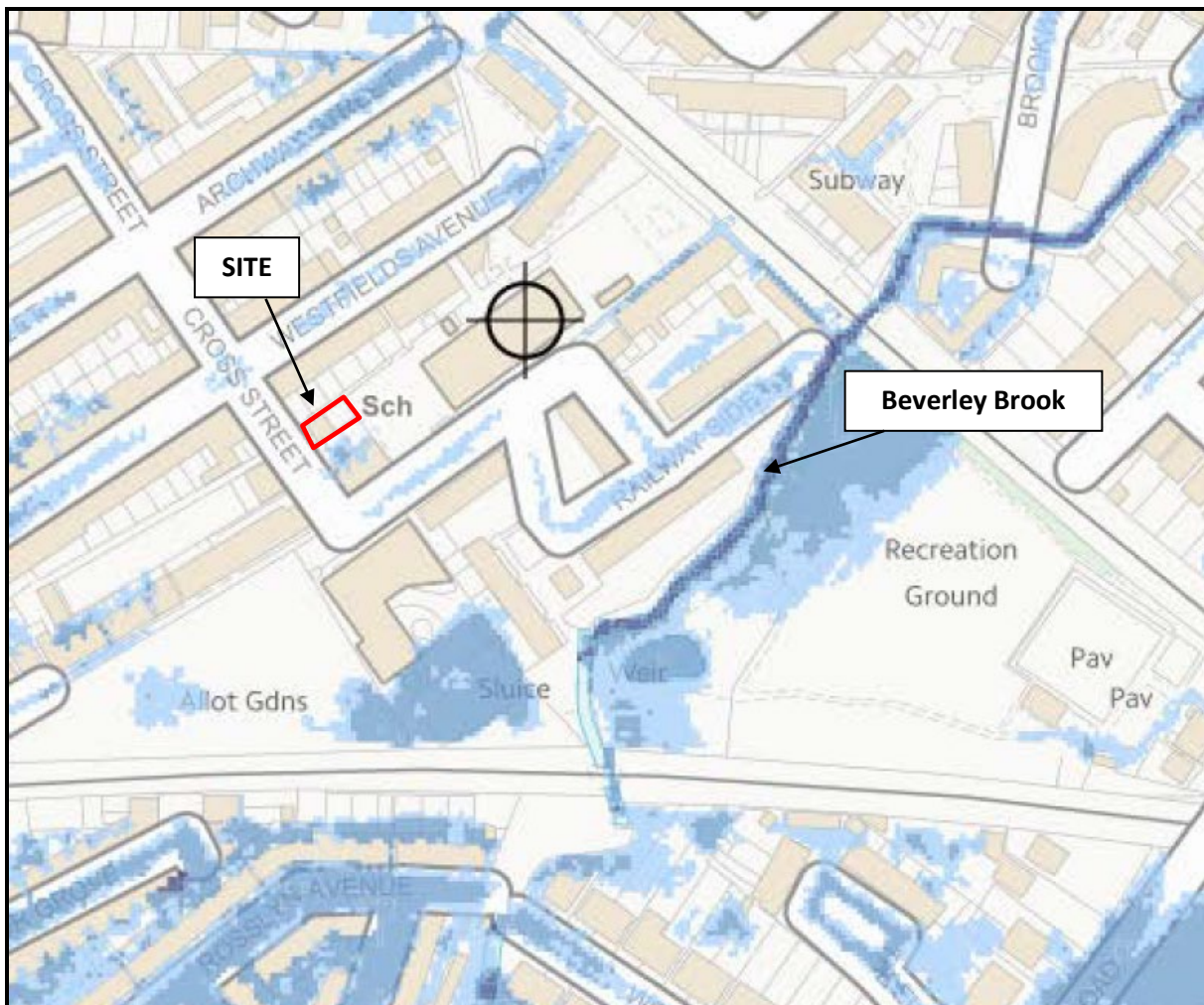
APPENDIX I Surface Water (Pluvial) Flooding (EA map extract)

EA SURFACE WATER FLOOD RISK

LOW RISK SCENARIO

The following map extract is taken from the Environment Agency (EA) on-line Long Term Flood Risk mapping (<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>). The map extract depicts the 'Low' risk flood scenario; where a 'Low' risk is between 1 in 1,000 [0.1%] and 1 in 100 [1%] in any given year.

There is no Surface Water (Pluvial) Flood risk indicated across the subject site.



THE SITE = Barnes Primary School, Cross Street, London, SW13 0QQ

Low Risk Flood Scenario Potential Flood Depth

