Flood Risk Assessment
For the Proposed Alterations to the Existing Building at
67-69 Barnes High Street, Richmond upon Thames, SW13 9LD
to Provide Four Additional Residential Units

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67-69 Barnes High Street, Richmond upon Thames, SW13 9LD
to Provide Four Additional Residential Units

1 Introduction

1.1 MTC Engineering (Cambridge) Limited has been asked to provide a Flood Risk Assessment in relation to the proposed demolition works, alterations and extensions to the existing property at 67-69 Barnes High Street, in the London Borough of Richmond upon Thames, to provide four additional residential units at the site on behalf of Pretoria Road Property Limited.

1.2 This Flood Risk Assessment is based on the following information:-

1.2.1 Environment Agency Modelled and Historical Flood Data.

1.2.2 London Borough of Richmond Upon Thames Strategic Flood Risk Assessment (SFRA) Update, March 2016.

1.2.3 London Borough of Richmond Upon Thames Planning Guidance Document Delivering SuDS in Richmond, February 2015.

1.2.4 Existing and proposed layouts supplied by Architecture Initiative.

1.2.5 Spot Level Data supplied by Architecture Initiative.

1.2.6 British Geological Survey information.

1.3 All the comments and opinions contained in this report including any conclusions are based on the information available to MTC Engineering (Cambridge) Limited during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Limited accept no liability should this prove to be the case, nor if additional information exists or becomes available with respect to this site.

1.4 MTC Engineering (Cambridge) Limited makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, MTC Engineering (Cambridge) Limited are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5 This report is a Flood Risk Assessment of flooding issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2 Site Description

2.1 The site is located on the northern side of Barnes High Street opposite Stanton Road, in the London Borough of Richmond upon Thames.

2.2 To the east and west the site is bound by existing development on the northern side of Barnes High Street, which in the vicinity of the site generally consists of ground floor commercial/residential uses with residential above.

2.3 To the north the site is bound by an area of car parking and development to the rear of Seaforth Lodge which is adjacent to the western side of the development.

2.4 To the south the site is bound by Barnes High Street, past which lies more development of a generally similar nature, along with Stanton Road which runs in a southwesterly direction.

2.5 Ground levels in the vicinity of the site are just over 5 metres above Ordnance Datum (AOD) based upon Ordnance Survey map data, with Barnes High Street falling in an easterly direction away from the site.

2.6 Spot levels provided on the existing site plans indicate that the level of the pavement on Barnes High Street to the front of the western access between the two commercial units are about 5.3m AOD, with the level at the access to the rear of the building at the southeastern corner of the site being about 5.2m AOD, and levels in the rear yard area surrounding the existing ground floor flat to the rear of the commercial units being about 5.4m AOD. The existing floor levels of the ground floor units vary between 5.39 and 5.41m AOD.

2.7 The River Thames runs in a northeasterly direction approximately 225m northwest of the site at its closest point. Whilst the Thames is naturally tidal at this point, the site lies well upstream of the Thames Barrier which is used to control water levels on the River Thames during extreme fluvial and tidal events, whilst tidal defences are present along the southeastern bank of the River Thames in the vicinity of the site.

2.8 Barnes Pond is located in Barnes Green, about 100 metres southeast of the site to the east of Station Road and south of Church Road, however is at a lower level than the site with land to the east of Barnes Pond being lower than land to the northwest in the vicinity of the site.

2.9 There are no further surface water features of note in the vicinity of the site.

2.10 The site is currently completely impermeable and occupied by an existing building which provides a ground floor estate agents at the Barnes High Street frontage, together with a ground floor residential flat.

2.11 British Geological Survey Mapping indicates that the underlying bedrock geology at the site is the London Clay Formation, with a superficial geology of the Kempston Park Gravel Formation present.

3 Sources of Potential Flood Risk

3.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

3.2 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding, whilst the second form of flood risk to be considered is tidal flooding.

3.3 The only significant source of either fluvial or tidal flood risk to the site is flooding from the River Thames, which is approximately 200 metres north of the site. Along this stretch of the River Thames the worst case flood scenarios occur when fluvial flood events combine with tidal surge events, therefore for the purposes of this Flood Risk Assessment these forms of flooding are considered together.

3.4 The Environment Agency Indicative Flood Risk Map (Appendix 2) indicates that the site lies in defended Flood Zone 3, whilst the Environment Agency have provided data in relation to modelled fluvial and tidal events on the River Thames in the vicinity of the site along with relevant defence information (Appendix 3).

3.5 The Strategic Flood Risk Assessment (SFRA) Map also indicates that the site lies in Flood Zone 3 (Appendix 4) however does not differentiate between defended and undefended Flood Zone 3 as the Environment Agency Flood Map does.

3.6 The Flood Zone 3 extent considers the natural flood plain without the impact of defences, as these may be breached or overtopped, however unless overtopping or breaching occurs there are two primary flood defences applicable to the proposed site which would prevent flooding. Firstly the raised defence walls along the southern bank of the River Thames which provide defence against tidal events and secondly the River Thames Barrier at Woolwich which provides defence against tidal surge events on the River Thames along with the potential for combination of tidal surge events with fluvial flood events upstream of the barrier.

3.7 The maximum design channel water level in the vicinity of the site is 6.00 metres above Ordnance Datum at node 2.17 during a 1 in 1000 year tidal event with allowance for climate change to 2100. It should be noted that this level is based upon the maximum design water level that will be permitted by the Thames Barrier in a variety of events, thus consideration of climate change or other return periods is not considered necessary in this instance.

3.8 Breach hazard mapping supplied within the SFRA (Appendix 4) indicates that the hazard at the site and in the surrounding block of land is low, however there is a moderate hazard along most of Barnes High Street to the front of the site which may act as a channel during a breach event as flow along the road would not be obstructed by buildings thus may have a quicker flow.

3.9 The most recent breach modelling data has however been provided by the Environment Agency, being from the Thames Tidal Upriver Breach Inundation Modelling Study of 2017, which supersedes the SFRA, with associated data provided in Appendix 3.

3.10 As can be seen mapping indicates that the site will remain just outside of the footprint of a breach event in 2014, when land a short distance north/northeast of the site may flood to an estimated water level of about 4.83m AOD (breach node 6). With external ground levels of about 5.3 to 5.4m AOD on the site itself and pavement levels of about 5.2 to 5.3m AOD at the frontage onto Barnes High Street the site itself should remain dry during such an event, with safe, dry access maintained available along Barnes High Street/Station Road in a southerly/southeasterly direction.

3.11 By 2100 the area effected during a breach event would increase and land in the vicinity of the site and on Barnes High Street would likely be subject to some shallow flooding. At modelled breach nodes 4 and 6 approximately at the front and rear of the site respectively the modelled water levels are 5.30m AOD and 5.26m AOD respectively.

3.12 As such based upon the spot levels provided on the existing site plans (Appendix 5) the rear area of the site would remain dry, however the Seaforth Lodge Car park to the east would be subject to approximately 0.2m flooding, and shallow flooding to a depth of 0 to 0.1m would be present on the northern footway of Barnes High Street with deeper flooding present in the vehicular carriageway which is lower than the footway.

3.13 At 5.39 to 5.41m AOD the existing floor levels of the ground floor units are however approximately 100mm above anticipated water levels in the vicinity of the site, thus are anticipated to remain dry during a breach event occurring in 2100.

3.14 As such whilst given the flood depths present on Barnes High Street some/most residents may be able to safely enter/exit the site in a breach event in 2100, any resident unable to do so would have safe refuge available at the site itself with buildings remaining dry.

3.15 No historical records of the site flooding under any circumstances have been provided by the Environment Agency, and no historic flood events (from any means of flooding) are recorded in the vicinity of the site on the Historic Flood Map provided in the SFRA.

3.16 Unless fluvial flood defences are breached it is unlikely that the site would flood as a result of fluvial or tidal flooding under any circumstances, whilst as the Environment Agency are effective at maintaining a targeted programme of inspection and maintenance of their most critical assets, such as those protecting London, the likelihood of a breach occurring is considered to be low.

3.17 The overall risk of fluvial or tidal flooding occurring at the site is considered to be low, whilst even in the worst case breach event in 2100 the site itself and existing buildings would remain dry.

3.18 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

3.19 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.

3.20 As the site is located above the adjacent Barnes High Street it is likely that any overland flow occurring under any circumstances would either be channeled east past the site along Barnes High Street or enter highway drainage systems without having any significant impact upon the site.

3.21 The surface water flood map provided in the SFRA does not indicate any significant risk of surface water flooding in the vicinity of the site, whilst the Environment Agency surface water flood map also indicates that the site and Barnes High Street is at a very low risk of surface water flooding.

3.22 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.

3.23 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land.

3.24 British Geological Survey Mapping indicates that the underlying bedrock geology of the site is the London Clay Formation which is an impermeable geology and would not have any significant groundwater present.

3.25 In the event that a perched water table was present in the overlying superficial geology then it is anticipated that any outflow would be directly to Barnes Pond to the southeast of the site or result in outflow to the lower lying land to the east rather than the development of spring lines in the vicinity of the site.

3.26 The fifth form of flood risk to be considered in accordance with the National Planning Policy Framework is the risk of flooding from blocked, overloaded, or burst, sewers and water mains.

3.27 Should any sewer or water main in the vicinity of the site on Barnes High Street become blocked or overloaded or burst water would tend to be channeled east along Barnes High Street rather than coming onto the site itself.

3.28 The last form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from reservoirs, canals or other artificial sources.

3.29 There are three reservoirs that are owned and maintained by Thames Water Limited that could potentially result in flooding in the vicinity of the site, with these being the Queen Mary, Queen Elizabeth II, and Queen Mother reservoirs.

3.30 Reservoir flooding is however considered extremely unlikely, as all large reservoirs are regularly inspected by reservoir panel engineers and as Thames Water are responsible for ensuring that the reservoirs remain well maintained.

3.31 As such the overall risk of flooding occurring at the site due to reservoirs is considered to be low.

4 The Proposal

4.1 The proposal involves demolition, extension and alteration works to the existing building at 67-69 Barnes High Street, Richmond upon Thames to allow the three existing residential units at the site to be converted to seven residential units, with the ground floor commercial units fronting Barnes High Street to be retained. A copy of the existing site and floor plans and elevations is provided in Appendix 5, with a copy of proposed floor plans and elevations provided in Appendix 6.

4.2 Floor levels of the building will remain at present, with the ground floor staying at existing floor levels of approximately 5.4m AOD.

4.3 Given that the site and surrounding land are defended against flooding and that the occurrence of a breach of defences is unlikely to occur, whilst at 5.4m AOD the floor level of the ground floor residential unit is above the worst case water level of 5.3m AOD that would occur in the vicinity of the site should a breach occur in 2100.

4.4 It is considered that the floor level being above water levels in a breach event will adequately protect the residential units and occupants against flooding in the unlikely event that a breach occurs and no flood resistant or resilient retrofitting is required.

4.5 The commercial units at the site frontage will remain largely unaltered from their current state with unaltered uses, and again floor levels are above the modelled 2100 breach levels at the site thus it is not considered that any specific flood resistant or resilient construction is required at either of these units.

4.6 It is likely that occupants would be able to safely access the site even during a breach event in 2100 via Barnes High Street and Station Road to the south/southeasterly direction from the site, whilst even if any resident could not safely exit the site during such an event the units themselves would provide a safe place of refuge for occupants for the duration of the event.

4.7 At present the site is entirely impermeable and is positively drained with the existing roof area of the building being of a standard impermeable construction falling directly to gutter systems drained to downpipes as shown on the existing ground floor and roof floor plans provided in Appendix 5. These are then believed to drain to the local surface water sewer system.

4.8 Post development the proposal will seek to reduce discharge rates from the site as much as is reasonable practicable in line with requirements. To achieve this all external areas being resurfaced will be resurfaced using permeable paving rather than impermeable material, which will again reduce discharge rates as water percolates slowly through to base layers whilst also providing treatment by filtration prior to discharge. Discharge from green roof area and other roof areas will initially be to the base layer of the permeable paving provided at the site.

4.9 As the site is underlain by a superficial geology of the Kempston Park Gravel Formation this may prove suitable for the use of infiltration systems subject to acceptable infiltration rates being obtained during testing at the site.

4.10 Should planning permission be granted infiltration testing will therefore be undertaken in line with BRE 365 and if acceptable infiltration rates are obtained then discharge of surface water from permeably surfaced areas will be via infiltration from the base of the permeable paving which is in line with the Drainage Hierarchy which considers infiltration as the preferable means of surface water discharge.

4.11 In the event that following testing infiltration rates are not sufficient to allow drainage of the site via infiltration then the base of the permeable paving will be used as an attenuation area to restrict discharge rates to the surface water sewer system below existing rates.

4.12 The proposal will therefore reduce the off-site risk of flooding and have a beneficial impact upon drainage as required under current local and national guidance.

4.13 As the proposal will create four additional residential units only it is considered a minor development, thus it is appropriate to apply a surface water drainage condition to any planning approval granted requiring full detailed design including details of infiltration test results, infiltration/attenuation calculations for a 1 in 100 year plus 40% climate change rainfall event, detailed engineering drawings, and a maintenance plan for SuDS systems. This information will therefore be provided at the conditional discharge stage to be approved prior to commencement of work on site.

4.14 Foul drainage from the site will continue as at present.

5 Assessment

5.1 The proposal involves extensions and alterations to the existing building at 67-69 Barnes High Street to allow the number of residential units provided to be increased from three to seven, with the ground floor commercial units retained.

5.2 In accordance with the National Planning Policy Framework residential development is classified as a “more vulnerable” development, whilst the commercial development is considered to be a “less vulnerable” development.

5.3 The site is shown on the Environment Agency Indicative Flood Risk Map as lying in Flood Zone 3, however this is based upon the natural flood plain ignoring the presence of defences.

5.4 Breach modelling provided by the Environment Agency indicates that the site would actually remain dry during breach event in 2100, and as detailed in Section 3 the flood risk to the site from any source of flooding is considered to be low.

5.5 In a breach event in 2100, which is considered to be the worst case potential flood event that could occur at the site under any circumstances, the water level in the vicinity of the site has been modelled as approximately 5.3m AOD.

5.6 Ground floor levels will remain as existing thus at about 5.4m AOD, and as such it is considered that the ground floor residential unit will be adequately protected against flooding with no flood resilient or resistant construction required.

5.7 At a water level of approximately 5.3m AOD it is likely that Barnes High Street and the northern footway would be subject to shallow flooding. Most residents would likely be able to safely traverse the local highway network and safely exit the site in such an event, however should flood water prove deeper elsewhere and prevent safe access or some occupants be unable to safely exit the site during a breach event in 2100 the units will provide a safe place of refuge for occupants.

5.8 Dry access should be maintained in all events other than a breach event in 2100.

5.9 As the site is classified as lying in defended Flood Zone 3a on the Flood Map for planning and involves a 'more vulnerable' residential element the Sequential and Exception Tests may be required. Both of these tests would be passed as detailed below.

5.10 **Sequential Test**

5.10.1 The aim of the Sequential Test is to where possible steer new development to areas at the lowest probability of flooding (Flood Zone 1), as stated in Paragraph 101 of the National Planning Policy Framework.

5.10.2 The Sequential Test does not seek to prevent development, but to where possible locate development outside of the natural flood plain as it is safer to located development on a site that does not flood in the first place rather than within potential flood plain and mitigate against the potential impacts of flooding.

5.10.3 Virtually all of the Barnes area is however located in defended Flood Zone 3a thus in this instance it is not possible to relocate the development to a site outside of Flood Zone 3a.

5.10.4 As detailed in Section 3, even in a breach event in 2100 it is considered that the site itself would remain dry as existing ground levels (approximately 5.4m AOD) are above the modelled water level in the vicinity of the site (5.3m AOD).

5.10.5 It is therefore considered that for the Barnes area the site is actually at a low risk of flooding and is actually Sequentially preferable to other sites in the local area which are also classified as Flood Zone 3a but are more likely to flood in a breach event.

5.10.6 It is therefore considered that the proposed development passes the Sequential Test.