



Calthorpe Street Flood Risk Assessment

For Rhomco

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1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Rhomco in support of a planning application for the proposed redevelopment of the existing brownfield site off Calthorpe Street, Banbury.

Local Planning Authorities are advised by the Government's National Planning Policy Framework (NPPF) to consult the Environment Agency (EA) on development proposals in areas at risk of flooding and / or for sites greater than 1 hectare in area. The EA requires a Flood Risk Assessment to be submitted in support of the planning application for the proposed development.

The report has been prepared to consider the requirements of the NPPF through:

- Assessing whether the proposed development is likely to be affected by flooding;
- Assessing whether the proposed development is appropriate in the suggested location, and,
- Detailing measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe, and that flood risk would not be increased elsewhere.

This report considers the requirements for undertaking a Flood Risk Assessment as stipulated in NPPF Technical Guidance. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been prepared in accordance with current EA policy.

2. SITE INFORMATION

2.1 Site Location

The site is located on approximately 1.5ha of brownfield land within the centre of Banbury, a market town in Oxfordshire. The site is bound to the east by Calthorpe Street, beyond which lies commercial developments. High Street and Marlborough Road bound the site to the north and north-west, with commercial developments also present in these areas. The site is bound to the south and south-east by residential developments.

The Oxford Canal is located approximately 550m to the east of the site with the River Cherwell 650m to the east, flowing southwards towards, and eventually discharging into, the River Thames. The Grimsbury Reservoir is located approximately 1.5km north-east of the site, upstream of the River Cherwell.

The site address can be found in **Table 1**. The site location can be found in **Figure 1**.

Table 1: Site Referencing Information

Site Referencing Information	
Site Address	Calthorpe Street, Banbury, Oxfordshire, England, OX16 5EX,
Grid Reference	SP 45485 40320 445485, 240320

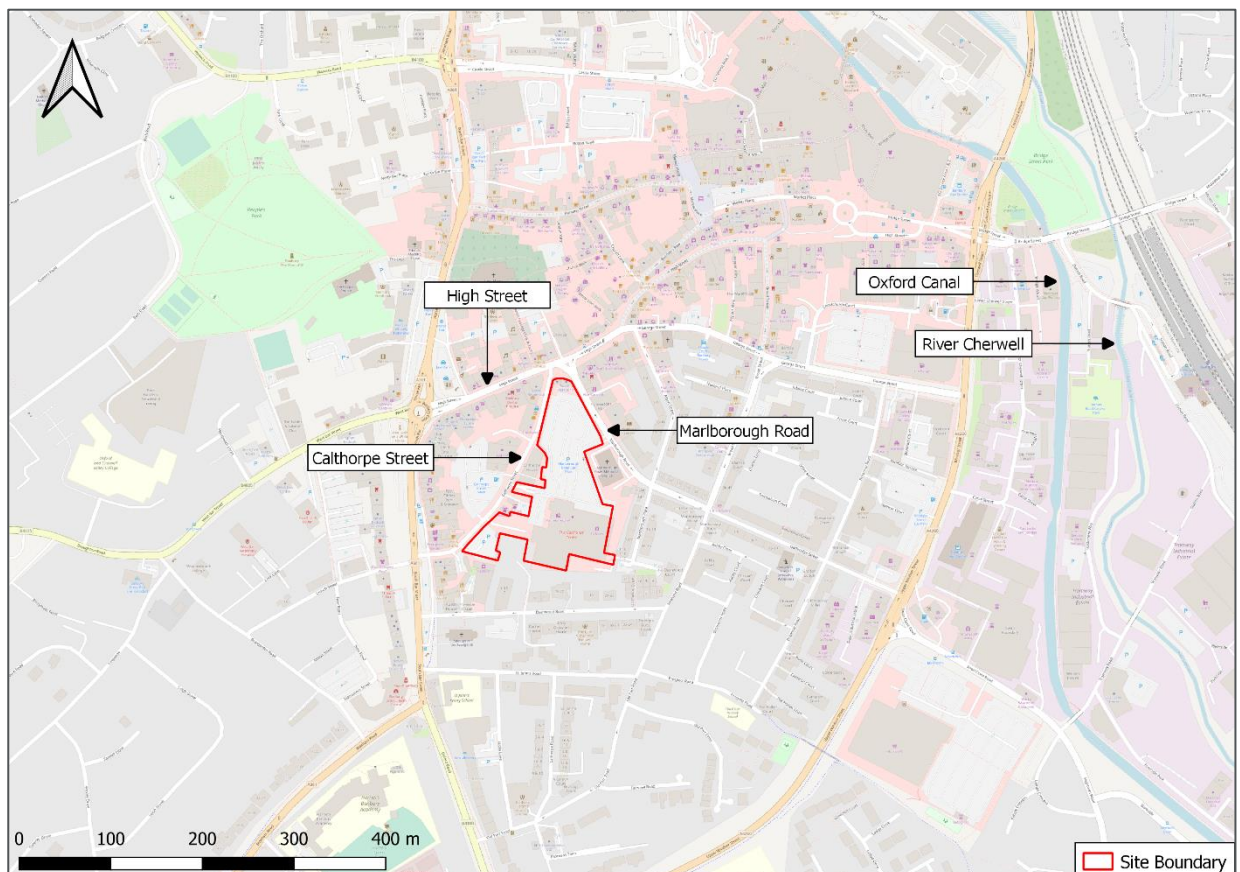


Figure 1: Site Location

2.2 Topography

A topographic survey was undertaken by Greenhatch Group in June 2020, covering the entire red line boundary. This is included in **Appendix A**.

The highest level on site is located in the south-west, adjacent to the south-west boundary on the access road of the southernmost site entrance on Calthorpe Street, at 104.00m AOD. The lowest level on site is located at the north, adjacent to Calthorpe Street, High Street and Marlborough Road, at 96.87m AOD. In general, the levels slope gently from south-north.

2.3 Site description

The site currently comprises of entirely developed land, including the commercial retail units and associated car parking of Farmfoods and TK Maxx at the southern half of the site, as well as an NPC car park at the northern half of the site.

2.4 Proposed Development

The proposal is for the development of approximately 230 residential units, comprising of 1, 2, 3 and 4 bed dwellings across 7No. apartment blocks and 9No. houses, with associated underground and aboveground car parking, landscaping and amenities.

A copy of the proposed layout is included within planning submission.

3. SOURCES OF FLOOD RISK

3.1 Fluvial Flooding

The Environment Agency Flood Map for Planning (**Figure 3**) shows the site to be situated entirely within Flood Zone 1 at low risk of fluvial flooding. This is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding. The site is therefore safe from the present day 1 in 100 year fluvial flood event.

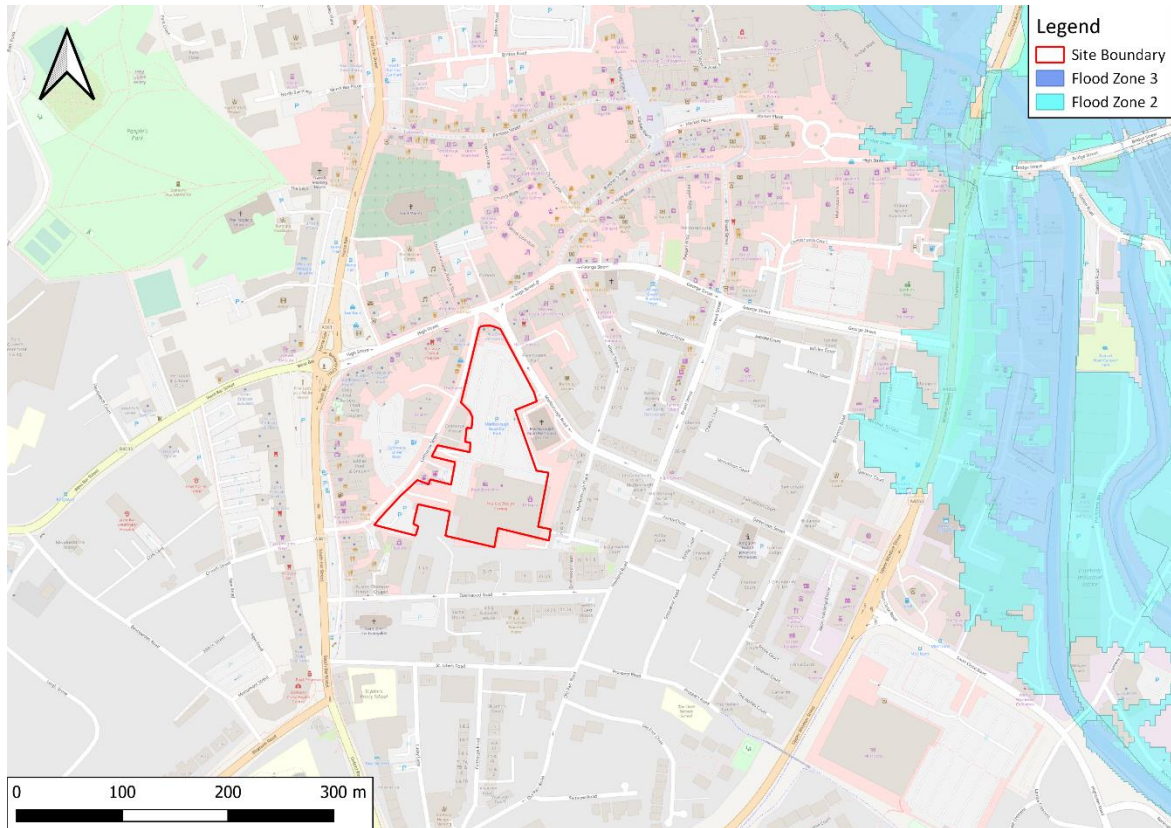


Figure 2: EA 'Flood Map for Planning'

For reference, the Environment Agency Flood Zones are defined as follows:

- Flood Zone 1 (Low Risk) comprises land having a less than 0.1% annual probability of river or sea flooding
- Flood Zone 2 (Medium Risk) comprises having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.
- Flood Zone 3a (High Risk) comprises land assessed as having a $\geq 1\%$ AEP of fluvial flooding in any given year, equivalent to the ≤ 100 yr return period flood event.
- Flood Zone 3b (Functional Floodplain) comprises land where water from rivers or the sea has to flow or be stored in times of flood. Functional floodplain will normally comprise:
 - » land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively
 - » land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

. The site is located approximately 350m west of the outer extent of Flood Zone 2, with the minimum site levels shown to be elevated approximately 10m above the worst-case flood extent. The NPPF requires that the future impact of climate change on flood risk should be considered, even for those areas currently in Flood Zone 1 therefore, a judgement can be made that the impact of climate change will not cause the floodplain to extend to reach the site.

Furthermore, the EA historic flood map does not show any recorded incidences of flooding at the site. The risk from fluvial flood risk at the site is consequently assessed to be **low**.

3.2 Tidal Flooding

EA Flood Map for Planning does not distinguish between fluvial and tidal flood risk. However, as the site is located inland with a lowest level of 96.87m AOD, the risk of tidal flooding at the site can be classed as 'negligible'.

3.3 Surface Water Flooding

Surface water flooding occurs as the result of an inability of intense rainfall to infiltrate the ground. This often happens when the maximum soil infiltration rate or storage capacity is reached. Flows generated by such events either enter existing land drainage features or follow the general topography which can concentrate flows and lead to localised ponding/flooding.

The EA Surface Water Flood Map (**Figure 3**) shows the majority of the site to be at 'very low' risk of flooding from surface water. Very low risk means that each year this area has a chance of flooding of less than 0.1%.

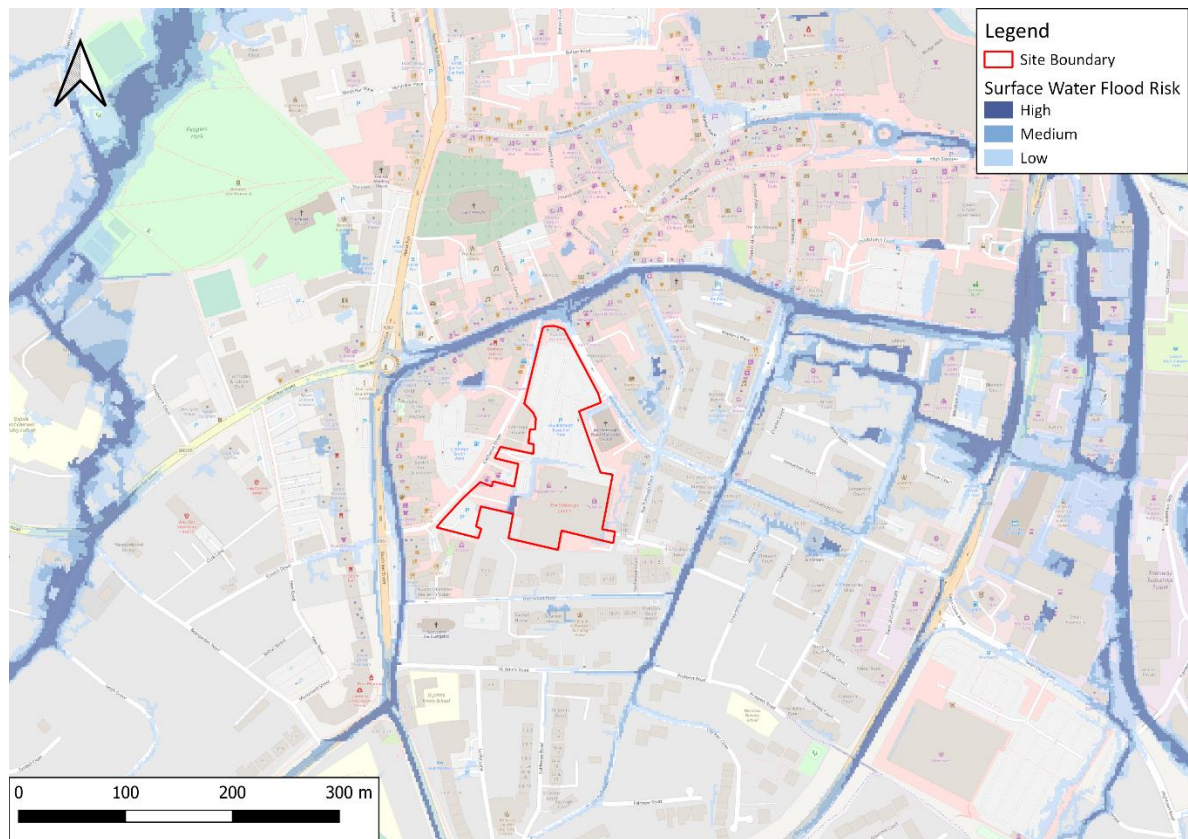


Figure 3: EA 'Risk of Flooding from Surface Water' - Extent

A small area of 'low' risk is located on the access road and extends southwards, adjacent to the existing development, meaning that this area has an annual chance of flooding of between 0.1% and 1%. A small area of 'high' risk is located at the south-west of the site, adjacent to the existing development, meaning that each year this area has a chance of flooding of greater than 3.3%. This is an area of localised ponding behind the existing buildings and does not provide any connectivity to the wider area.

It should be noted that the EA Surface Water Flood Map does not account for existing drainage systems, and therefore the extent of flooding shown would likely be significantly less and that is considered as the 'worst case' risk.

Under the medium risk scenario (1% AEP event), displayed in **Figure 4**, the majority of the site is shown to be flood free. The small area of localised ponding behind the buildings in **Figure 3** is shown to flood at a depth of below 300mm.

The EA Surface Water Velocity Flood Map indicated that this area will flow at a velocity of less than 0.25m/s, suggesting the water will pond.



Figure 4: EA Surface Water Flood Map - Depth

Whilst the potential effects of climate change could increase the frequency, depth and extent of on-site surface water flooding, the general 'very low' surface water flood risk of the site suggests that any increase in these variables will not significantly impact the site.

The risk of surface water flooding to the site is therefore assessed to be **low**.

3.4 Groundwater Flooding

The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site comprises of the Charmouth Mudstone Formation - Mudstone. BGS also indicate that the site is underlain by superficial deposits comprising of Alluvium. This suggests the bedrock may have a low to moderate degree of permeability, where water can flow through the rock following extended period of rainfall.

With regards to groundwater vulnerability, according to 'Magic' maps the site is in a 'Secondary Undifferentiated' Aquifer. According to the EA, secondary undifferentiated aquifers are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value. Secondary A & B aquifers are defined below:

- Secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers
- Secondary B aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers

Cherwell Level 1 Strategic Flood Risk Assessment (SFRA) Update 2017 provides a general assessment of groundwater flooding within the district. The SFRA provides an 'Areas Susceptible to Ground Water Flooding' map, which indicates the site is in a 1km² area which is <25% susceptible to groundwater flooding. The risk posed to the site is therefore assessed to be low. It should be noted that this provides an assessment of the ability for groundwater to emerge (based on ground conditions) and not the probability of occurrence. The presence of historic flooding provides a better measure of probability. The SFRA makes no mention of any recorded incidences of groundwater flooding at or near the site.

The risk of groundwater flooding is assessed to be **low**.

3.5 Infrastructure failure

As the site is currently brownfield and the surrounding area is developed, it is likely there is an extensive public drainage system serving the area. In the event of any surcharging of sewer networks on Calthorpe Street, the prevailing topography indicates sewer flood water could flow onto site. However, if any surcharging of sewer networks took place on High Street and Marlborough Road, the topography indicates sewer flood water would flow away from the site. It should be noted however that this is a residual risk.

Thames Water is the statutory water undertaker and keeps a record of historic sewer flood events in a database called the DG5 register. According to data presented in the SFRA 2017, the site falls within a postcode where there have been between 0-5 recorded incidences of sewer flooding, although the SFRA makes no mention of any recorded incidences at the site.

Therefore, the risk of sewer flooding at the site is assessed to be **low**.

The EA Flood Risk from Reservoirs Map does not show the site to lie within the extent of potential reservoir flooding.

The Oxford Canal is located approximately 550m to the east of the site. The 2017 SFRA states:

'A series of locks control water levels along the Oxford Canal with a series of overflow weirs ensuring any excess flows in the canals are diverted to the River Cherwell. During flood conditions the River Cherwell and the Oxford Canal are largely co-joined and therefore comments regarding the surcharging of the canal and the scope for flood protection and compensation are as for Main Rivers'

Therefore, as the risk of fluvial flooding to the site is low and accounting for the co-joining of the River Cherwell and the Oxford Canal during flooding conditions, the risk of canal flooding is assessed as low.

The sites elevation is approximately 11m higher and 550m away from the Oxford Canal, a judgement can be made that in the event of a breach the site would not be affected. Therefore, flooding from canals is judged to pose a **low** risk to the development.

4. LOCAL PLANNING POLICY

4.1 Cherwell Local Plan 2011-2031

The Local Plan was adopted in July 2015 and sets out the vision and objectives for the district up to 2031, setting out clear policies to guide decision on planning applications. The following policies are relevant to flood risk.

4.1.1 *Policy ESD 6: Sustainable Flood Risk Management*

The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.

In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.

Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.

Site specific flood risk assessments will be required to accompany development proposals in the following situations:

- All development proposals located in flood zones 2 or 3
- Development proposals of 1 hectare or more located in flood zone 1
- Development sites located in an area known to have experienced flooding problems
- Development sites located within 9m of any watercourses.

Flood risk assessments should assess all sources of flood risk and demonstrate that:

- There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)
- Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.

Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.

The proposed development meets this policy as it is situated entirely within Flood Zone 1 and it at low risk from all forms of flooding. In addition to this, any residual risk of surface water flooding will be addressed by an appointed contractor which will confirm the proposed drainage system.

5. NATIONAL PLANNING POLICY FRAMEWORK

5.1 Sequential and Exception Test

This assessment has demonstrated that the site is on land designated as Flood Zone 1 by the EA's Flood Map for Planning, and is at low or negligible risk of flooding from all other potential sources.

The proposal can be classed as a 'More-Vulnerable' development, in accordance with the NPPF. . More Vulnerable developments are compatible in Flood Zone 1 in accordance with the NPPG. This means the Proposal does not need to pass the Exception Test. This is displayed below in **Table 2**.

Table 2: NPPG Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception Test Required	✓	✓
Flood Zone 3a	Exception Test Required	✓	X	Exception Test Required	✓
Flood Zone 3b	Exception Test Required	✓	X	X	X

Therefore, application of the Sequential and Exception Tests are not required for this site.

5.2 Mitigation Requirements

The following mitigation measures are recommended to mitigate any residual flood risk and ensure that the proposal will be safe over the lifetime of the development. This accounts for the vulnerability of its occupiers, without increasing flood risk elsewhere, in accordance with the requirements outlined in the NPPF.

5.2.1 Finished Floor Levels

The site is not modelled to be impacted by the 1 in 100 year + CC or 1 in 1000 year fluvial flood events. However, in order to adopt a design for exceedance approach the Finished Floor Levels (FFLs) are recommended to, where practicable, be raised 150mm above the current ground levels.

5.2.2 Access and Egress

Safe access and egress should be maintained over the lifetime of the development. The site is modelled to be at low risk from all sources flooding over the lifetime of the development. Access to the site from Calthorpe Road is also shown to be free from surface water flooding under the 1% AEP design flood event. Therefore, access and egress are possible to the site over the lifetime of the development.

5.2.3 Floodplain Storage

As the site is not being developed within the 1% AEP fluvial floodplain (Flood Zone 3), any changes will not displace floodwater. Therefore, the proposed development is not considered to increase flood risk within the catchment through a loss of floodplain storage and no further mitigation measures are required.

5.2.4 *Additional Residual Risk*

Any risk from surface water and sewers, as well as the impact of the development on flood risk elsewhere, will be addressed by an appointed contractor which will confirm the proposed drainage system.

Residual risk associated with groundwater and surface water to the area of underground car park should will be addressed by appropriate building, drainage and highways design. In additional, and where required it would be recommended for the basement to be of tanked construction and include a sump and pump type arrangement for dealing with any water that may enter the building.

6. SUMMARY

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Rhomco in support of a planning application for the proposed redevelopment of the existing brownfield site.

The Environment Agency Flood Map for Planning shows the site to be situated entirely within Flood Zone 1 at low risk of fluvial flooding. This is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding. This is the lowest flood zone classification given by the EA and is considered safe from flooding. It has also been assessed that the impact of climate change will not significantly change the probability of flooding at the site. In accordance with the NPPF, the application of the Sequential and Exception Tests are not required.

Other sources of flood risk were also assessed at the proposed development area. Tidal flood risk has been discounted. Groundwater flooding was also assessed to be low, as the proposal is not developing in a manner sensitive to groundwater flooding. Infrastructure flooding was also assessed to be low.

Surface water and sewer flooding was assessed to be low. Any risk from surface water and sewers, as well as the impact of the development on flood risk elsewhere, will be addressed by an appointed contractor which will confirm the proposed drainage system.

The Finished Floor Levels (FFLs) are recommended to, where practicable, adopt a design for exceedance approach to be raised 150mm above the current ground levels.

Safe access and egress is possible over the lifetime of the development.

This report therefore demonstrates that, in respect of flood risk, the proposed development of the site:

- Is suitable in the location proposed.
- Will be adequately flood resistant and resilient.
- Will not place additional persons at risk of flooding, and will offer a safe means of access and egress.
- Will not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage or impedance of flood flows.

The application is therefore concluded to meet the flood risk requirements of the NPPF.

Appendix A - Topographic Survey