Level 2 Strategic Flood Risk Assessment – Site LPR30

Final Report

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Prepared for:
Hinckley and Bosworth Borough Council

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Hinckley & Bosworth Borough Council

Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for site LPR30. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Hinckley and Bosworth Level 1 SFRA and read the Hinckley and Bosworth Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land East of Groby Cemetery and Ratby Road, situated in the southwest of Groby on the outskirts of Leicester
- Site area: 4.41ha
- Existing site use: Greenfield
- Proposed site use: Residential

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. Higher ground is concentrated towards the west of the site, where the maximum elevation is 96.4mAOD by the western boundary. The site slopes downwards towards the east, where an unnamed watercourse flows south along the eastern boundary. The minimum elevation is found by the watercourse at the southeastern boundary, at 83.3mAOD.

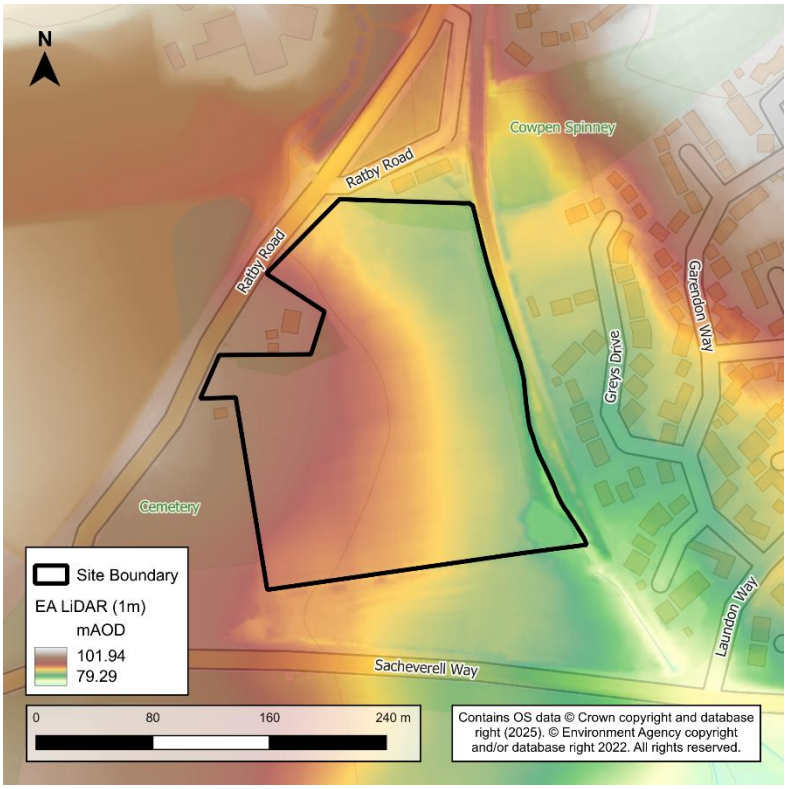


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - Edwalton Member bedrock comprised of mudstone.
- Superficial deposits – Alluvium deposits, comprising clay, silt, sand and gravel, underlay the northern and eastern boundaries along the path of the watercourse. Thrussington Till Member, consisting of diamicton, underlays the centre and west of the site. There is a stretch across the north, east, and south where there are no superficial deposits.

Soils at the site consist of slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located in the mid-reach of Rothley Brook (tributary of the River Soar) catchment. Rothley Brook flows in a northeasterly direction approximately 1km southeast of the site. Upstream of the site, the catchment contains several settlements, including Bagworth, Desford, and Ratby. A large portion of the upstream catchment is also rural farmland and woods. Woodland areas include Bagworth Heath Woods, Browns Wood upstream, and Crow Wood.

2.2 Existing drainage features

There is an unnamed ordinary watercourse that flows east along the northern boundary of the site. At the northeastern corner of the site, this joins with another unnamed ordinary watercourse that has travelled around 40m from Ratby Road in the north. The watercourse continues south along the entire eastern boundary, leaving the site to flow southeast to discharge into the Rothley Brook, which is an EA main river.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment to inform Flood Zones 2 and 3a.

Flood Zone 3b has been defined using the EA's Rivers and Sea 3.3% AEP defended flood risk extent.

2.3.2 Description of risk to the site

The site is not shown to be at fluvial flood risk based on the EA's FMfP.

The unnamed watercourse along the northern and eastern boundaries is not represented within the EA's FMfP. The risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 2.4).

2.4 Surface water

2.4.1 Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

2.4.2 Description of risk to the site

In all surface water events, there is a flow path along the northern and eastern boundaries associated with the unnamed watercourse. The flow path extends furthest into the northeast and by the small body of water in the southeastern corner of the site. In the 3.3% AEP event, 9% of the site is at risk. These areas of risk expand by 3.7% and 7.1% in the 1% and 0.1% AEP events, respectively. The risk is contained to the flow path along the north and east of the site, and the rest of the site remains clear from surface water flood risk.

The 3.3% AEP and 1% AEP show maximum depths exceeding 1.2m in a small area along the watercourse but predominantly exceeding 0.9m but not 1.2m along the eastern boundary. Along the northern boundary, the maximum depths exceed 0.3m in the 3.3% AEP event, and 0.6m in the 1% AEP event. In the 3.3% AEP event, the maximum velocity exceeds 1.0m/s. In the 1% AEP event, the maximum velocity exceeds 2.0m/s in the east and 1.0m/s in the north. Both the 3.3% and 1% AEP events have a maximum hazard classification of 'Danger for All' along the eastern boundary, and 'Danger for Most' along the northern boundary.

The 0.1% AEP flood depth stays above 1.2m along the eastern boundary but exceeds 0.6m in the north. The maximum velocities exceed 2m/s, and the hazard classification is 'Danger for All'.

Table 2-1: Existing surface water flood risk based on the RoFSW map.

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	9.0	3.7	7.1
Maximum depth (m)	Exceeds 1.2m	Exceeds 1.2m	Exceeds 1.2m
Maximum velocity (m/s)	Exceeds 1.0m/s but does not exceed 2m/s	Exceeds 2.0m/s	Exceed 2.0m/s
Maximum hazard classification	'Danger for All'	'Danger for All'	'Danger for All'

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, excluding the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP does not include the 3.3% AEP percentage).*

2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

2.6 Groundwater

The JBA Groundwater Emergence Map shows that the site has a negligible risk from groundwater flooding due to the nature of the local geological deposits.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

2.7 Sewers

Severn Trent Water were consulted as part of the Regulation 18 process and each of the Strategic Housing and Employment Land Availability Assessment reports to provide comments on known issues of sewer flooding within or surrounding the site. There is some model predicted flooding on the combined system downstream. Due to the relatively small size of the development, the impact on sewer capacity is thought to be low.

This assessment does not negate the requirement that drainage at the site should be in line with the drainage hierarchy (see Section 6.1).

2.8 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Information provided by Leicestershire County Council shows that there was an incident north of the site in 2013 near Ratby Road and Woodbank Road. There were issues with maintenance of the watercourse and a partially collapsing retaining wall.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Hinckley and Bosworth Level 2 SFRA report for information on climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and escape must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

The EA's FMfP Flood Zones plus Climate Change layer has been used to indicate areas of the site likely to be at increased flood risk in future.

3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer shows the site is unlikely to be at increased fluvial flood risk in future.

The unnamed watercourse along the northern and eastern boundaries is not represented within the EA's FMfP within the site. The future risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 3.2).

3.2 Surface water

3.2.1 Available data

In the absence of suitable climate change data, the 0.1% AEP extent from the EA's RoFSW mapping has been used as a proxy to indicate areas likely to be at risk during the 1% AEP plus climate change event.

3.2.2 Description of risk to the site

The RoFSW mapping shows that the sites are not very sensitive to increased risk with climate change. The greatest difference between the 1% and 0.1% AEP events is the increase in flood extents, by 7.1%, although the risk is contained to the flow path along the watercourse in the north and east of the site.

Both the 1% and 0.1% AEP events have maximum depths exceeding 1.2m along the eastern boundary and depths exceeding 0.6m in the north. The maximum velocity exceeds 2.0m/s in the east and 1.0m/s in the north in the 1% AEP event, increasing to 2.0m/s in the north in the 0.1% AEP event. The 1% AEP event has a maximum hazard classification of 'Danger for All' along the eastern boundary, and 'Danger for Most' along the northern

boundary. The 0.1% AEP event also has a hazard classification of ‘Danger for All’ in the north.

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

The asset register provided by Leicestershire County Council indicates the presence of a culvert beneath Ratby Road upstream of the site. However, the location of this is not clear based on available online mapping. This should be investigated further as part of a site-specific FRA as there is a residual risk that blockage of the culvert could cause water to back-up and overtop the road, flowing into the northern area of the site.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

5.2 Access and escape

Safe access and escape routes will need to be demonstrated in the 1% AEP plus climate change surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

5.2.1 Potential access

The site can be accessed via Groby Road, which runs along the northwestern site boundary. Part of Ratby Road, near the roundabout, also borders the site.

5.2.2 Fluvial

Access and escape are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset.

5.2.3 Surface water

In all events, the flow path associated with the unnamed watercourse on the northern site border impacts the area near and on Groby Road and Ratby Road roundabout. Continuing north of this roundabout, there is also a large flow path on Ratby Road. Depths here exceed 0.3m in all events, and so likely obstructs access and escape travelling north on Ratby Road. However, access and escape are likely possible to the site when travelling south on Groby Road towards Sacheverell Way, as while there is ponding here in the 0.1% AEP event, depths are below 0.3m.

5.3 Dry islands

The site is not located on a dry island.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the National standards for SuDS (gov.uk). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.

The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is mudstone and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner (see Section 2.7).

The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1%, and 0.1% AEP events associated with the watercourse. This unnamed watercourse found along the northern and eastern boundaries should be integrated into the site drainage strategy as blue-green infrastructure.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the site:

- Surface water discharge rates must not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The unnamed watercourse discharges into the Rothley Brook (trib of Soar), which has a 'moderate' ecological classification. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.

7 NPPF and planning implications

7.1 Exception Test requirements

The Local Planning Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.

The NPPF classifies residential development as 'More Vulnerable'.

The Exception Test is not required, because the site is not shown to be at fluvial flood risk within the EA Flood Map for Planning.

7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site is:

- greater than 1 hectare
- at risk of flooding from surface water
- identified as being at increased flood risk in the future.

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Hinckley and Bosworth Local Plan Policies.

The development should be designed with mitigation measures in place where required.

7.3 Guidance for site design and making development safe

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk by the flow path along the northern and eastern boundaries associated with the unnamed watercourse. Developers should consider utilising the area around the unnamed watercourse as a green corridor or as a location for SuDS.

A detailed hydraulic model of unnamed watercourse will be required at FRA stage to accurately represent the risk from this watercourse. This should include investigation of the potential culvert beneath Ratby Road and the associated residual risk to the site.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as

possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

If proposed works affect an ordinary watercourse, Leicestershire County Council as the Lead Local Flood Authority should be contacted respectively to obtain prior written consent. Any watercourses should be accommodated within the site layout and should not be culverted except for where access is required. The site layout should allow for access to any watercourse for maintenance and they should generally be located within publicly accessible areas. A buffer of at least 8 metres should be maintained between the watercourses and any built development.

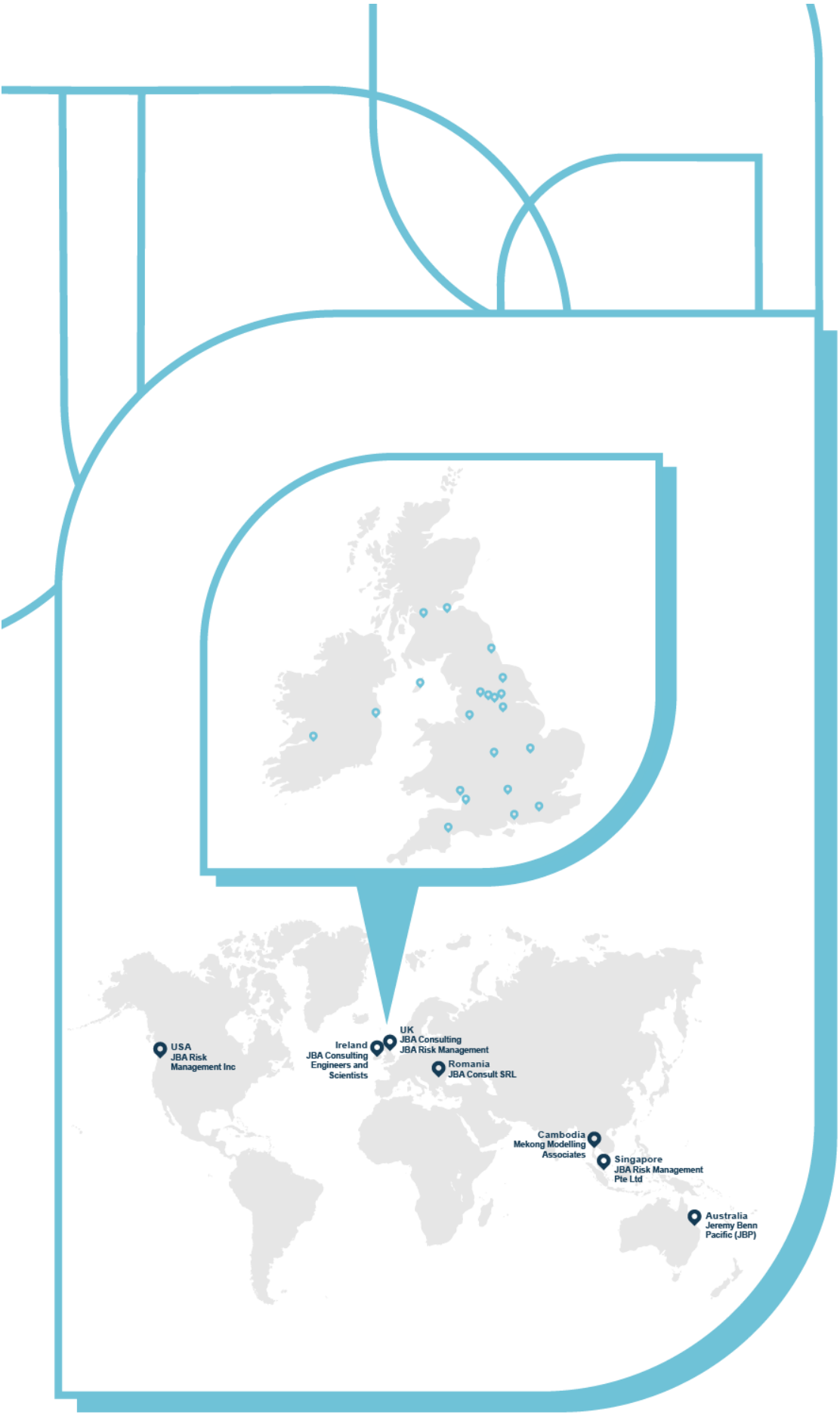
8 Conclusions

There is an unnamed watercourse that travels along the northern and eastern boundaries of the site, continuing south where it discharges into Rothley Brook. This watercourse is not represented within the EA's FMfP. However, the ordinary watercourse risk is shown within the EA surface water map, where there is a flow path along the northern and eastern boundaries in all events. The flow path extends furthest into the northeast and by the small body of water in the southeastern corner of the site. The risk is contained to these areas around the flow path, and the rest of the site remains clear from risk.

The Exception Test is not required, because the site is not shown to be at fluvial flood risk within the EA Flood Map for Planning. However, a site-specific FRA will be required, because the proposed development site is one hectare or greater in Flood Zone 1, subject to ordinary watercourse and surface water flooding, and identified as being at increased flood risk in the future.

The following points should be considered in development of this site:

- A buffer of at least 8 metres should be maintained between the unnamed watercourse and any built development on the site.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk by the flow path along the northern and eastern boundaries associated with the unnamed watercourse. Developers should consider utilising the area around the unnamed watercourse as a green corridor or as a location for SuDS.
- A detailed hydraulic model of unnamed watercourse may be required at FRA stage to accurately represent the risk from this watercourse. This should include investigation of the potential culvert beneath Ratby Road and the associated residual risk to the site.
- Further assessment of the surface water risk to the sites should be undertaken as part of a site-specific FRA to quantify the volume of surface water risk at the sites and ensure that any modification of ground levels required as part of the site design will not displace surface water and increase flood risk off the sites.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change surface water event. Access and escape travelling north from the site on Ratby Road is likely obstructed, but reaching the site may still be possible when travelling from the south on Groby Road from Sacheverell Way.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling.
- Flood mitigation measures should be implemented then tested to check that they will not displace water elsewhere (for example, if land is raised to permit development in one area, compensatory flood storage will be required in another).



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Registered Office
1 Broughton Park
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Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
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