Level 2 Strategic Flood Risk Assessment – Site LPR139

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 LPR139. 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 to the south of the residential area of Market Bosworth
- Site area: 9.61ha
- 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. The EA 1m resolution LiDAR shows that higher elevation is concentrated in the northeast of the site, with elevations sloping downhill towards the site boundaries in the south and west. The maximum elevation is 120.5mAOD at the northeastern boundary, and the minimum elevation is 95.5mAOD at the western boundary of the site. To the west of the site is a raised railway embankment at a higher elevation in comparison to the west of the site at approximately 98.0mAOD. At the western site boundary, there is two raised areas which sit at an elevation of approximately 97.0mAOD.

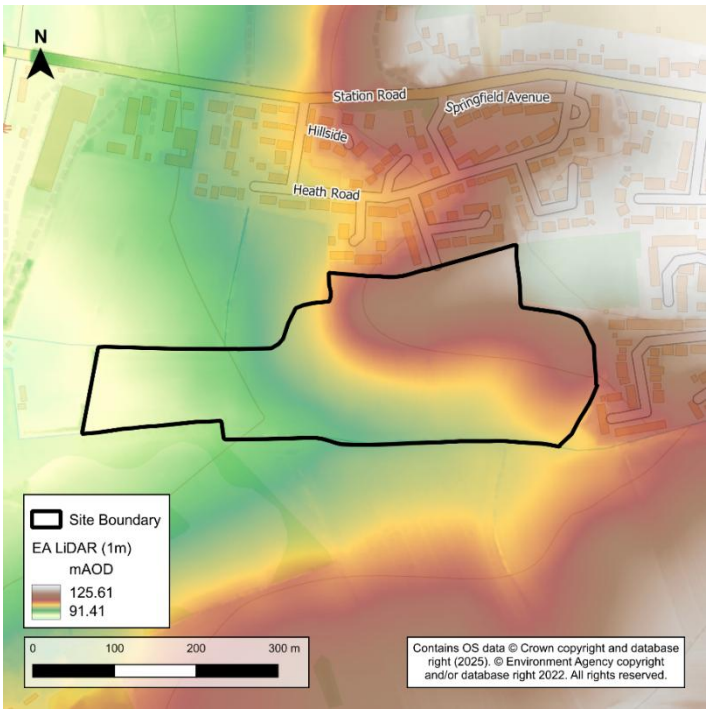


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: Gunthorpe Member comprised of mudstone.
- Superficial deposits:
  - Glaciofluvial deposits comprising sand and gravel in the northeast of the site.
  - Oadby Till Member comprising diamicton in the centre and to the south of the site.
  - Bosworth Clay Member comprising clay and silt at the western boundary of the site.

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 in the northern most point and upstream end of the 'Stoke Golding Brook from Source to River Sence Water Body' catchment, in Market Bosworth. The catchment draining to the site is approximately an area of 0.5km^2. There is an unnamed watercourse flowing west along the southern border of the site, and another unnamed watercourse flowing south to the north of the site and then west along the northwest boundary of the site. The catchment is predominantly urban, encompassing the western side of the settlement Market Bosworth.

2.2 Existing drainage features

An unnamed watercourse flows east to west along the southern site boundary. Another unnamed watercourse emerges from a culvert on Heath Road to the north of the site and flows as an open channel towards the northwest of the site before flowing west along the site boundary. The two watercourses converge approximately 140m west of the site, where they enter a culvert beneath the railway line, and again through a culvert under the Ashby de la Zouch Canal, before continuing to flow west.

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 watercourses along the southern and northern site boundary are 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

The RoFSW mapping indicates that surface water flooding extents are primarily aligned with existing watercourses and low-lying areas within the site. In all AEP events, there is a surface water flow path that flows west along the southern and western boundaries of the site.

In the 3.3% and 1% AEP events, surface water is largely confined to the areas of lowest elevation surrounding the watercourse along the southern and western site boundary, with a minor instance of surface water being present where the unnamed watercourse enters the site at the northwestern site boundary.

In both events, the maximum depths, velocities, and hazards (as shown in Table 2-1) are found along the lowered topography representing the watercourse channel on the southern site boundary. Across the main part of the site depths are not shown to exceed 0.3m and are classified as 'Very Low Hazard'.

During the 0.1% AEP event, surface water extents become more widespread along the flow path of the watercourse, particularly in the southwestern corner of the site. Surface water during this event also slightly encroaches onto the southeastern site boundary, at the end of York Close. During this event, the maximum depth is 1.2m, with the maximum velocity exceeding 2.0m/s along the southern boundary. There is an area in the west of the site where depths exceed 0.3m away from the site boundary with hazard classification of 'Danger for Most', but otherwise the risk away from the boundaries is not shown to exceed 0.3m and have hazard classification of 'Danger for Some' or 'Very Low Hazard'.

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* (%)	4.4	3.0	5.5
Maximum depth (m)	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.9m but does not exceed 1.2m	Exceeds 1.2m
Maximum velocity (m/s)	Exceeds 2.0m/s	Exceeds 2.0m/s	Exceeds 2.0m/s
Maximum hazard classification	Danger for Most	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 groundwater emergence risk is concentrated in the northern region of the site. Groundwater levels are predominantly between 0.5m and 5m below the ground, with an area of groundwater levels between 0.025m to 0.5m below the surface to the west of this area. Throughout the 0.025m to 0.5m groundwater risk area, there are minor instances of groundwater levels being at or within 0.025m of the ground surface.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow south and southwest to areas of lower elevation, towards the unnamed watercourses.

The south and west of the site is considered to be at negligible risk of groundwater emergence due to the nature of the underlying geology.

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. A sewer capacity assessment previously completed for this site (ref: HiB-071-0006) identified medium capacity risk relating to storage at the sewage pumping station that this development would connect to.

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 no recorded flood incidents on or surrounding the site.

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 watercourses to the south and the northeast are 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 EA RoFSW mapping shows that the site is sensitive to climate change. The main difference between the 1% and 0.1% AEP events is the increase in extent, particularly near the western site boundary along the unnamed watercourse and the area of higher elevation at the western site boundary, and just outside the site at the railway embankment.

In the western side of the site there are areas of risk that extend away from the site boundary with depths exceeding 0.2m and hazard classification of 'Danger for Some' in the 0.1% AEP event.

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

To the west of the site, there is considerable risk where the watercourses converge and flow through a culvert beneath the railway line. This results in the extensive RoFSW coverage in this area, as water accumulates against the elevated railway embankment. There is a residual risk of this increasing if the culvert was to become blocked.

The topography of the site means any water is likely to remain confined to the low-lying areas surrounding the unnamed watercourse at the south and west 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 event. 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 has one existing access option from Ambion Rise at the centre of the northern boundary to the site. Potential access could be created from York Close and the unnamed road off Shenton Lane to the east of the site, as well as off Shenton Lane to the south of the site.

Information provided by Hinckley and Bosworth Borough Council shows that access is likely to be via the adjacent scheme to the northwest of this site which has planning permission at the time of writing.

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 the 3.3%, 1%, and the 0.1% AEP events, surface water is largely confined to the areas of lowest elevation surrounding the unnamed watercourse along the southern and western site boundary, with a minor instance of surface water being present where an unnamed watercourse enters the site at the northwestern site boundary. Surface water along Ambion Rise exceeds 0.2m in depth, but does not exceed 0.3m, meaning the surface water depth is likely to be passable. However, the velocity exceeds 2.0m/s, with a hazard classification of 'Danger for Some' in the 0.1% AEP event, potentially restricting access and escape from this site. Any potential access and escape from the south will need to consider the watercourse which runs along the southern site boundary, as velocities exceed 1.0m/s in all AEP events with a 'Danger for Most' hazard classification.

When considering the currently proposed access and escape from the adjacent site to the northwest, there is an existing surface water flow path which flows in a south-westerly direction to the north of the site through the adjacent site. However, the depths along this flow path remain predominantly below 0.2m, with velocities below 1.0m/s, and a hazard

classification of ‘Very Low Hazard’, in all modelled AEP events. Therefore, access and escape are unlikely to be impeded.

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:

- Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- 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. The unnamed watercourse and flow path along the southern site boundary 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 should 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.
- 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 for this site because the site is located entirely in fluvial Flood Zone 1 of the EA FMfP.

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 ordinary watercourse and 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 low-lying area surrounding the unnamed watercourse at the south of the site, as well as by the unnamed watercourse to the northeast of the site where significant surface water risk is evident.

A detailed hydraulic model of the unnamed watercourses along the southern site boundary and northwest site boundary may be required at FRA stage to accurately represent the risk from these watercourses. Detailed survey of the culvert to the west of the site under the railway line embankment is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site

Developers should consider utilising the flow path along the southern site border as a green corridor or as a location for SuDS.

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 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

Low-lying areas in the south and west of the site alongside the unnamed watercourse are at risk of flooding from this watercourse, represented within the surface water mapping. There is a culvert outside the site boundary to the west of the site which flows under the railway line embankment, which presents a residual flood risk.

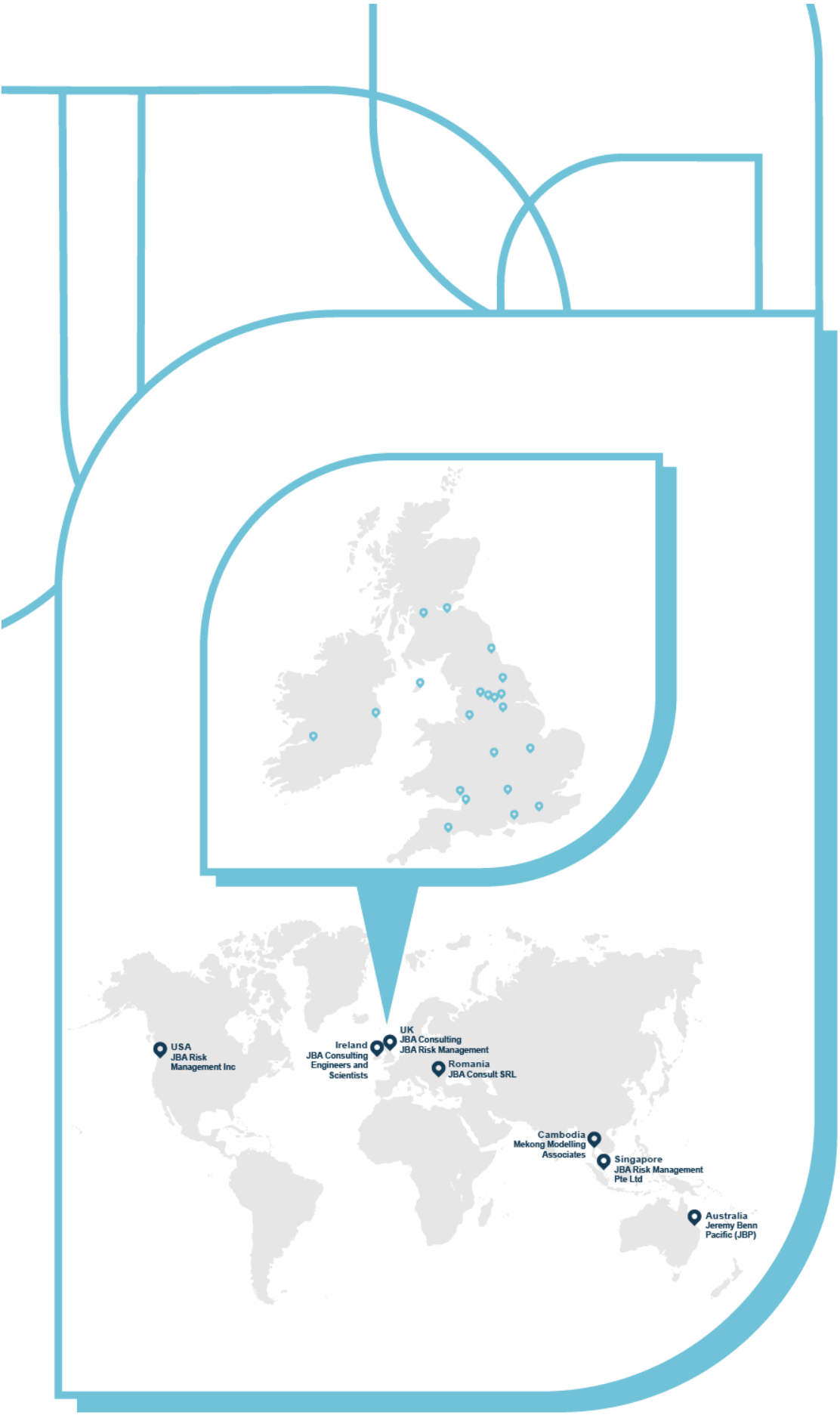
Should ‘More Vulnerable' development be proposed within the extent surface water flooding, the Exception Test will be required for this site.

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 sites are 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 watercourses and any built development.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk in the south and west of the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the unnamed watercourses along the southern site boundary and northwest site boundary may be required at FRA stage to accurately represent the risk from these watercourses. Detailed survey of the culvert to the west of the site under the railway line embankment is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. This initial assessment has highlighted potential surface water issues along Ambion Rise. Options for access and escape from the south are likely to need to be informed by a detailed hydraulic model of the unnamed watercourses. However, the access currently proposed is from the adjacent development site to the northwest which this assessment has shown is likely to be possible.
- 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 with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site.
- 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
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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