Level 2 Strategic Flood Risk Assessment – LPR200

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 LPR200. 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 east of Clickers Way (A47), Earl Shilton, located between Watery Gate Lane, the M69, and Station Road (B581)
- Site area: 109.8ha
- 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 LiDAR shows that the site is largely on lower ground, with elevated terrain being concentrated in the centre and western side of the site, with an area of high elevation in the northwest corner of the site. Ground elevations slope relatively steeply downhill from west to east, towards the paths of the watercourses. The minimum elevation is 79.3mAOD near the southeastern boundary, and the maximum elevation is 103.9mAOD near the western boundary of the site.

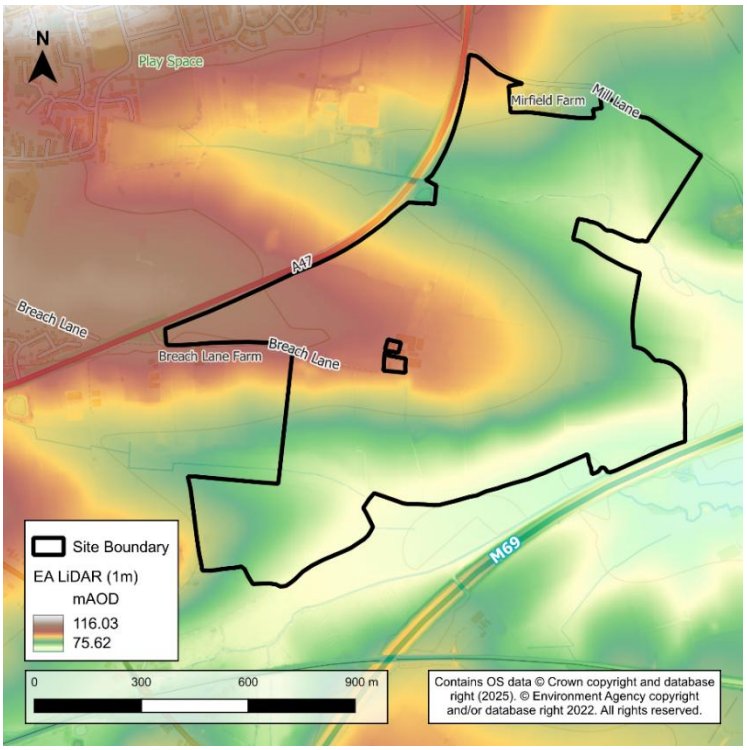


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: Mainly Edwalton Member, comprised of mudstone. The southern and southeast of the site is underlain by the Mercia Mudstone Group. There is an area of Gunthorpe Member, consisting of mudstone, surrounded by a layer of Cotgrave Sandstone Member in the eastern side of the site.
- Superficial deposits:
    - Oadby Till Member comprising diamicton covers most of the site.
    - Alluvium comprising clay, silt, sand and gravel along the path of the unnamed watercourses.
    - Wigston Sand and Gravel Member comprising sand and gravel in the western side of the site.
    - Bosworth Clay Member comprising clay and silt near the southwest boundary of the site.

Soils at the site consist mainly of slightly acid loamy and clayey soils with impeded drainage, with a small area near the western border consisting of freely draining slightly acid loamy soils.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is within the downstream end of the Thurlaston Brook Catchment (Tributary of Soar), which drains an area of 65.4km^2. An unnamed tributary of Thurlaston Brook bisects the north of the site, entering through the western boundary of the site, flowing in an easterly direction and exiting through the eastern site boundary. The catchment upstream of the site is predominantly rural, with several small settlements including Thurlaston, Peckleton, Kirkby Mallory, and Mallory Park.

2.2 Existing drainage features

The unnamed tributary of Thurlaston Brook enters the site via a culvert under Clickers Way (A47) to the west. The watercourse then flows in an easterly direction through the northern end of the site, before leaving the site where it is culverted beneath the M69, approximately 340m east of the site.

There is an unnamed watercourse that bisects the south of the site flowing in an easterly direction, then continues along the southern boundary of the site and is then culverted under the M69 at the southeast corner of the site. Additionally, there is another unnamed watercourse that flows easterly to the south of the site, which meets with the previously mentioned unnamed watercourse just as it is culverted under the M69.

Additionally, online mapping shows the presence of a pond located approximately 375m east of the site.

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.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment.

2.3.2 Description of risk to the site

Most of the site is shown to not be at fluvial flood risk.

Flood Zones 2, 3a and 3b are shown to follow the path of the unnamed watercourse through the southern end of the site and along the southern site boundary. The topography of the site means that fluvial risk is confined to the low-lying areas along the banks of the watercourse and does not extend further north into the site.

Flood Zones 3b and 3a show very similar extents. In Flood Zones 2, the extent increases slightly in the southwest corner, but the largest increase is near the southeast boundary, where the watercourse is culverted under the M69 and flow is restricted.

The unnamed watercourse that transects the north of the site 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).

Table 2-1: Existing fluvial flood risk based on EA FMfP.

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
96.2	1.7	<1	1.9

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, excluding the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 does not include the Flood Zone 3 percentage.*

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 most of the site is not at risk from surface water flooding.

During the 3.3% AEP event there are several areas of surface water ponding in the northern end and southeastern corner of the site, located mainly in areas of low elevation and the watercourses. There are several small areas of ponding in the western side of the site.

In the 1% event, a flow path develops in the northern end of the site which follows the path of the unnamed watercourse. New areas of surface water ponding develop in the western side and northeastern corner of the site.

In the 0.1% event, the surface water flow path increases in event, with the flow path extending further into the northeast of the site. Existing areas of surface water ponding increase in extent, primarily the area of ponding in the southeast corner of the site. New areas of ponding develop in the eastern side and near the southeastern corner of the site, near where the unnamed watercourse is culverted under the M69.

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

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	<1	1.0	3.8
Maximum depth (m)	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.6m but does not exceed 0.9m
Maximum velocity (m/s)	Exceeds 0.5m/s but does not exceed 1.0m/s	Exceeds 0.5m/s but does not exceed 1.0m/s	Exceeds 1.0m/s but does not exceed 2.0m/s
Maximum hazard classification	Danger for Most	Danger for Most	Danger for Most

** 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 majority of the site is shown to be at negligible risk of groundwater emergence due to the nature of the underlying geology.

There is an area in the southwest of the site where groundwater levels are between 0.5m and 5m below the ground surface, which aligns with where the area the superficial deposits of Wigston Sand and Gravel Member comprising sand and gravel is located. In this area there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

There is an area in the eastern side of the site where groundwater levels are between 0.025m and 0.5m below the ground surface. In this area there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.

At the eastern boundary, there is small area where groundwater levels are either at or very near (within 0.025m of) the ground surface. Within this area there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow in an easterly direction and away from the site along the path of the unnamed watercourse in the north of the site.

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. The site is considered to have a high potential impact on the sewerage infrastructure due to the large size of the site. There is model predicted flooding upstream of the combined sewer system. Therefore, Severn Trent Water should be consulted at an early stage to discuss drainage requirements for the site.

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.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment including modelling of the latest climate change uplifts.

3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer is marginally larger than in the present day extent, with the most increase in extent being in the southeast corner of the site. No new areas of flooding are identified between the present day and climate change scenarios.

The unnamed watercourse that transects the north of the site is not represented within the EA's FMfP. 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 site is significantly sensitive to climate change. The main difference between the 1% and 0.1% AEP events is that the surface water flow path in the that transects the northern end of the site increases in extent and extends further into the northeast corner of the site.

Additionally, between the 1% and 0.1% existing areas of surface water ponding increase in extent and new areas of ponding develop, primarily near the eastern side and in the southeast corner of the site.

Within the site maximum depths and hazard classification remain unchanged between the AEP events, but velocities increase from exceeding 0.5m/s to exceeding 1.0m/s in the northern end of the site along the path of Thurlaston Brook, indicating additional surface water hazard under future climate conditions.

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 unnamed watercourse within the site is culverted where it exists the site beneath the M69, creating potential residual risk of a blockage resulting in water backing up within the site. The topography of the site means any water is likely to remain confined to the floodplain of the unnamed watercourse in the southern end of the site.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning Area. A small area near the southern boundary of the site is within the Upper Soar catchment Flood Alert Area (034WAF402).

5.2 Access and escape

Safe access and escape routes will need to be demonstrated in the 1% AEP plus climate change fluvial and 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 from the north via Mill Lane, via Clickers Way (A47) and from the west from Breach Lane via Clickers Way (A47). The M69 runs along the southeastern site boundary, providing potential access. There is potential for a new access route from Station Road (B581) to the south of the site.

Due to the two watercourses which bisect the site (one represented within the EA FMfP and one represented within the EA RoFSW map) access and escape needs to be considered separately to the north, centre, and southwest parcels of the site.

5.2.2 Fluvial

The EA FMfP shows the fluvial risk bisects the site and access and escape needs to be considered separately to the southwestern corner of the site.

Along the southeastern site boundary adjacent to the M69, there is a risk of fluvial flooding along the path of the unnamed watercourse which is likely to impede access and escape from the south. However, access and escape routes from the A47 to the northwest are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset. Therefore, safe access and escape should be possible to the north and centre of the site.

To access the southwest corner of the site, if it is not possible to cross the unnamed watercourse within the site, an access route could be provided from the A47 or B581, to access from the north. Access from the south along the B581 may be impeded as the road is shown to be impacted by fluvial risk to the north of the railway line where it crosses one of the unnamed watercourses.

5.2.3 Surface water

Thurlaston Brook bisects the site in northern end of the site. During the 3.3% AEP event, access and escape routes remain largely clear, with a few minor instances of surface water

ponding in the south of Clickers Way near the junction with Station Road, further north near where the watercourse is culverted, on Station Road (B581) and Breach Lane. In the 3.3% AEP event near where the watercourse is culverted under Clickers Way water depths exceed 0.3m but do not exceed 0.6m. Further south on Clickers Way near the junction with Station Road water depths exceed 0.6m but do not exceed 0.9m. During the 3.3% AEP event, access and escape will still be possible to the northern parcel of the site via Mill Lane and to the southwestern parcel via Station Road.

During the 1% AEP event, surface water ponding on Clickers Way minorly increases in extent and a few new small areas of ponding develop on Clickers Way, Station Road and Mill Lane. In the 1% AEP event ponding where the watercourse is culverted under Clickers Way water and further south on Clickers Way near the junction with Station Road water depths exceed 0.6m but do not exceed 0.9m. During the 1% AEP event, access and escape will still be possible to the northern parcel of the site via Mill Lane and to the southwestern parcel via Station Road.

During the 0.1% AEP event, surface water extents increase again, mainly near where the watercourse is culverted under Clickers Way and on Station Road. There are a few new small areas of surface water ponding on Mill Lane. In the 0.1% AEP event near where the watercourse is culverted under Clickers Way water depths exceed 1.2m. Depths on Mill Lane exceeds 0.2m but do not exceed 0.3m. Further south on Clickers Way near the junction with Station Road water depths exceed 0.6m but do not exceed 0.9m. During the 0.1% AEP event, access and escape will still be possible to the northern parcel of the site via Mill Lane and to the southwestern parcel via Station Road.

In all AEP events, access and escape to the centre of the site from west is not possible from Clickers Way due to the depths of water.

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:

- Most of 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 predominantly 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 1% and 0.1% AEP events. The unnamed watercourses in the northern and southern ends of the site 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.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. 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’.

Should ‘More Vulnerable’ development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. ‘More Vulnerable’ development will not be permitted within Flood Zone 3b.

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:

- in Flood Zones 2, 3a, and 3b.
- greater than 1 hectare.
- at risk of flooding from surface water.
- identified as being at increased flood risk in 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. This includes by the low-lying area surrounding Thurlaston Brook, in the north of the site where significant surface water risk is evident, and in the southern end of the site, near the unnamed watercourse, which is shown to have a fluvial flood risk.

A detailed hydraulic model of the unnamed tributary of Thurlaston Brook and the unnamed watercourse may be required at FRA stage to accurately represent the risk from this watercourse. Detailed survey of the culvert downstream of the site is likely to be required to ensure this is properly represented within the modelling as the available flood risk mapping shows this culvert is likely to significantly impact the flood extent within 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 and 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. As the watercourse is bisected by two watercourses, access and escape will need to be considered separately for the northern, central, and southern areas of the site.

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

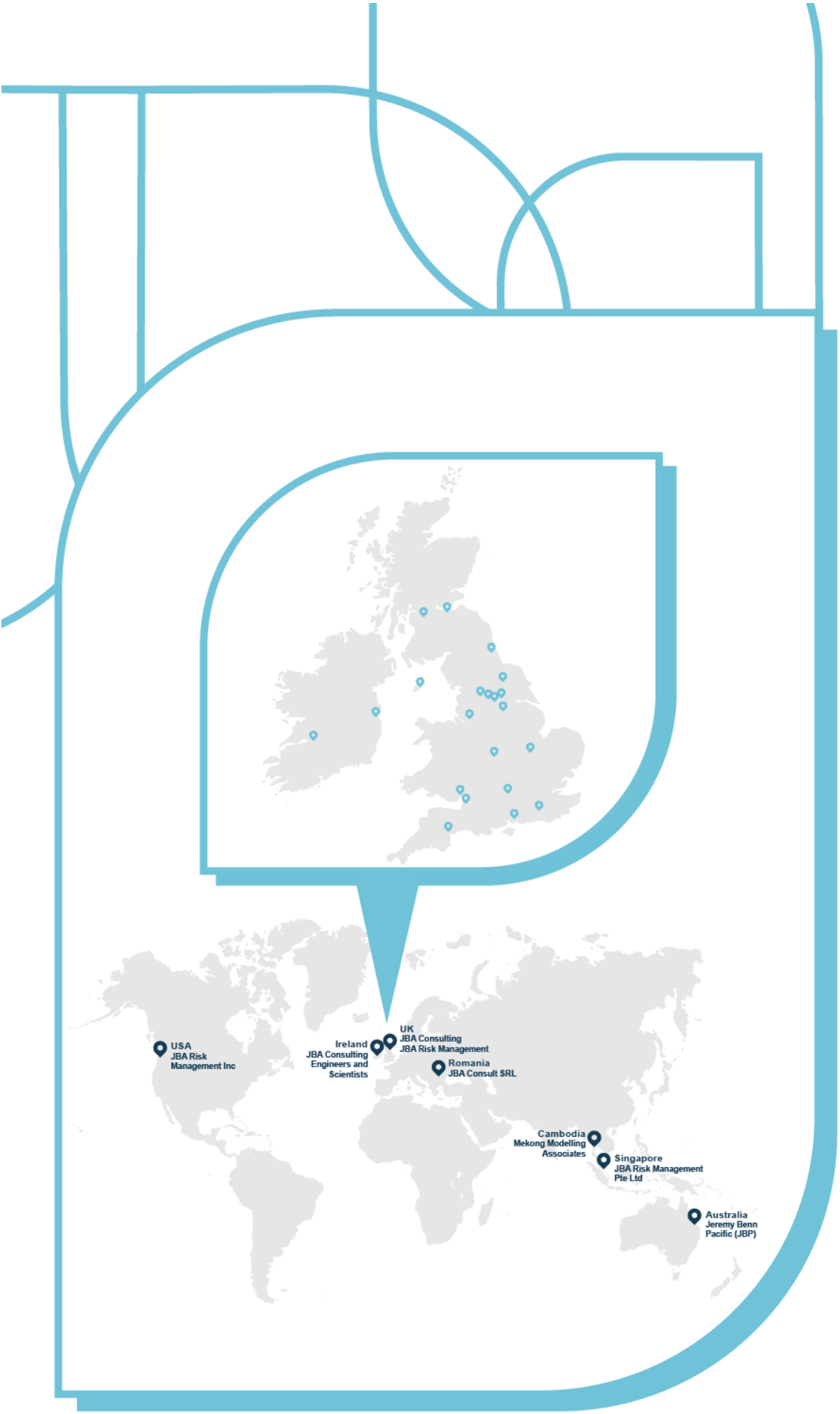
The site is affected by fluvial and surface water flooding, but the majority of the site is not shown to be at flood risk. The southern end of the site, in which the unnamed watercourse is located, is at risk from fluvial flooding, and is located within Flood Zones 2, 3a, and 3b. Low-lying areas in the northeast of the site alongside the unnamed watercourse are at risk of flooding from this watercourse, represented within the surface water mapping. The culvert in the southeast of the site presents a residual flood risk.

Should 'More Vulnerable' development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. 'More Vulnerable' development will not be permitted within Flood Zone 3b.

A site-specific FRA will be required, because the proposed development site is greater than 1 hectare, in Flood Zones 2, 3a and b, subject to 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 northeastern and southern ends of the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the Thurlaston Brook that bisects the north of the site and the unnamed watercourse that transects the southern end of the site may be required at FRA stage to accurately represent the risk from these watercourses. Detailed survey of the culvert downstream surrounding the site is likely to be required to ensure this is properly represented within the modelling as the available flood risk mapping shows this is likely to significantly impact the flood extent within the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. As the site is bisected by two watercourses, access and escape will need to be considered separately for the northern, central, and southern areas of the site.
- 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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