Level 2 Strategic Flood Risk Assessment - Site 11

A1-C01

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Prepared for:

Newcastle-under-Lyme Borough Council

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Contents

1 Background 3

1.1 Site details 3
1.2 Topography 3
1.3 Geology and soils 3

2 Sources of flood risk 4

2.1 Location of site within the catchment 4
2.2 Existing drainage features 4
2.3 Fluvial 4
2.4 Surface water 5
2.5 Reservoir 5
2.6 Groundwater 6
2.7 Sewers 6
2.8 Flood history 6

3 Flood risk management infrastructure 7

3.1 Defences 9
3.2 Residual risk 9

4 Emergency planning 10

4.1 Flood warnings and alerts 10
4.2 Access and egress 10
4.3 Dry islands 11

5 Climate change 7

5.1 Fluvial 7
5.2 Surface water 7

6 Requirements for drainage control and impact mitigation 12

6.1 Broadscale assessment of possible SuDS 12
6.2 Opportunities for wider sustainability benefits and integrated flood risk management 12

7 NPPF and planning implications 14

7.1 Exception test requirements 14

7.2 Requirements and guidance for site-specific Flood Risk Assessment 14
7.3 Guidance for site design and making development safe 14

8 Conclusions 16

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site 11. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Newcastle-under-Lyme Level 1 SFRA' and read the 'Newcastle-under-Lyme Level 2 SFRA Main Report' and is therefore familiar with the terminology used in this report.

1.1 Site details

- **Location:** Hardingswood Road, Kidsgrove.
- **Site area:** 0.82ha.
- **Existing site use:** Brownfield (vehicle storage).
- **Proposed site use:** Gypsy and Traveller.

1.2 Topography

The Environment Agency (EA) 1m resolution LiDAR shows that the site is relatively flat. The highest elevation is 128.89mAOD at the south-east site extent and the lowest elevation is 124.77mAOD, located at the north-west site extent. The site is bounded by an area of higher elevation to the east and lowest elevation to the north and south where the site is bordered by canals.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: Ten-feet Rock (north Staffordshire) consisting of sandstone across most of the site. Some small areas of Pennine Middle Coal Measures Formation consisting of mudstone, siltstone and sandstone along the eastern and western site boundaries.
- Superficial: Glaciofluvial deposits consisting of sand and gravel.

Soils at the site consist of restored soils mostly from quarry and opencast spoil.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is within the south-eastern, upstream reach of the 'Kidsgrove Stream (including Day Green Stream) Catchment' which drains an area of approximately 23.85km². The catchment is a combination of rural areas and the urban areas of Kidsgrove and Alsager. The Trent and Mersey Canal runs adjacent to the northern site boundary and the Macclesfield Canal runs adjacent to the southern site boundary.

2.2 Existing drainage features

The Trent and Mersey Canal runs adjacent to the northern site boundary and the Macclesfield Canal runs adjacent to the southern site boundary. There are no drainage features apparent within the site boundary.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment.

2.3.2 Description of risk to the site

The FMfP shows that the large majority of the site is located in Flood Zone 1. Flood Zones 2 and 3 are shown to slightly encroach on the northern site extent. However, these flood extents do not appear to be representative of the underlying topography, with the elevation of the site approximately 4m higher than the elevation of the canal along the northern extent. There are lower-lying areas to the north of the canal which would be likely to flood prior to any issues being experienced at the site. A site-specific Flood Risk Assessment (FRA) would be required to confirm the fluvial risk to the site, but based on this initial Level 2 SFRA it is likely that the site is not at fluvial risk based on its elevation.

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

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
95	5	3	3

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

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. It should be noted the EA RoFSW mapping in this location is derived from a local surface water model which covers the Newcastle-under-Lyme urban centre. No further details on this modelling were available at the time of this SFRA.

2.4.2 Description of risk to the site

In the 3.3% AEP event, most of the site is not shown to be at surface water risk. Areas of pooling are shown to appear along the western and southern site extents. Depths are shown to remain below 0.60m and velocities are shown to remain below 0.25m/s. Most of the areas shown at risk have the hazard classification of 'Danger to Some' but there are small areas along the southern site boundary with the classification of 'Danger to Most'.

In the 1% AEP and 0.1% AEP events, most of the site is still shown to not be at surface water risk. The at-risk areas largely reflect that of the 3.3% AEP event, with a slight increase along the south-east and north-west site boundaries. Depths and velocities remain below 0.60m and 0.25m/s respectively. Hazard classifications also remain largely the same with only small areas along the southern site boundary with the classification of 'Danger to Most'.

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* (%)	9	9	9
Maximum depth (m)	0.30 to 0.60	0.30 to 0.60	0.30 to 0.60
Maximum velocity (m/s)	0 to 0.25	0 to 0.25	0 to 0.25
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, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

2.5 Reservoir

Reservoir flood mapping shows the western edge of the site to be affected by the Dry Day and Wet Day flood extents from the Bathpool Park Lane reservoir. Both the Dry Day and Wet Day extents impact the same amount of area within the site.

2.6 Groundwater

The EA Areas Susceptible to Groundwater Flooding (AStGWF) dataset (1km resolution) suggests that the entire site has between 50% and 75% susceptibility to groundwater flooding.

The JBA Groundwater Emergence Map (5m resolution) shows that the entire site has predicted groundwater levels groundwater levels that are either at or very near (within 0.025m) of the ground surface.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool in the north-east low-lying areas 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 FRA stage.

2.7 Sewers

The site is located in a postcode area (ST7) with 41 recorded sewer flooding incidents, according to United Utilities' incident records (for the period from September 2010 to May 2024). However, the incidents are not located in the vicinity of the site with none of the incidents being reported along adjacent roads to the site.

2.8 Flood history

The EA's historic flooding and recorded flood outline datasets do not have a record of any flooding 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 3.5 of the main Level 2 SFRA report for information on fluvial models and 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 routes must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

In the absence of detailed hydraulic modelling with climate change uplifts, the FMfP Flood Zone 2 extent (0.1% AEP) has been used as an indicative 1% AEP event plus climate change flood extent. This can be compared within Flood Zone 3a (1% AEP) to give an indication of areas most sensitive to the impacts of climate change.

3.1.2 Description of risk to the site

There is a small increase in the fluvial flood risk extent at the site between Flood Zone 3a and Flood Zone 2, however the site is not shown to be particularly sensitive to the impacts of climate change with the risk remaining confined to the northern boundary. As discussed in Section 2.3.2, based on the underlying topography it is likely that the fluvial risk to the site is overestimated within the EA FMfP.

3.2 Surface water

3.2.1 Available data

The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk.

The design event for rainfall intensities is the 1% AEP event with the upper end climate allowance for the 2070s epoch, which is the 1% AEP plus 45% climate change for the Weaver and Gowy Management Catchment which this site falls within.

It should be noted that at this site the EA RoFSW mapping is from a local surface water model, and therefore not comparable with the climate change uplifts run as part of the Level 1 SFRA, which are the original national generalised models developed as part of the updated Flood Map for Surface Water (uFMfSW) during 2012-13. Section 3.2.2 describes what the climate change mapping shows, however, due to discrepancies between the RoFSW mapping and climate change uplifts further assessment of the surface water risk to

the site for both the present day and future risk will be required as part of a site-specific FRA.

3.2.2 Description of risk to the site

In the 1% AEP plus 45% climate change scenario, the areas shown to be at risk do not extend into the site. Areas at risk are shown to run adjacent to the northern and southern site boundaries.

4 Flood risk management infrastructure

4.1 Defences

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

4.2 Residual risk

The Trent and Mersey Canal runs adjacent to the northern site boundary and the Macclesfield Canal runs adjacent to the southern site boundary. These could pose a residual risk to the site in the event of a breach or overtopping, which could cause water to encroach on the site. The Canal & River Trust are responsible for the management of both canals and have provided a dataset with the location of known breach and overtopping incidents. There is a recorded overtopping incident on the Trent and Mersey Canal located approximately 360m north-west of the site.

5 Emergency planning

5.1 Flood warnings and alerts

The northern extent of the site is located in the 'River Dane catchment including Kidsgrove, Sandbach, Congleton, Middlewich and Northeast Crewe' Flood Alert Area.

5.2 Access and escape routes

Safe access and escape 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 Existing access

Existing access to the site is from Hardingswood Road which runs adjacent to the eastern site boundary.

5.2.2 Fluvial

Within the 1% AEP and 0.1% AEP events, there are flood risk areas present on Hardingswood Road to the north-east of the site. However, safe access and escape along Hardingswood Road from the south are maintained.

5.2.3 Surface water

Access and escape via Hardingswood Road from the north of the site is unlikely to be possible during all modelled surface water events as there is a considerable area of surface water risk which develops within the 3.3% AEP event.

Access and escape via Hardingswood Road from the south are likely to be maintained during the 3.3% AEP surface water event. There are some areas of ponding which develop along Hardingswood Road to the south of the site however flood depths are shown to remain below 0.30m with hazard classification mostly 'Very low hazard' with only small areas of 'Danger for some'.

During the 1% AEP event access and escape are likely to be impeded as the entirety of Hardingswood Road is shown to be at surface water risk to the south of the site. Whilst depths mainly remain below 0.3m there are small areas shown to reach depths of up to 0.60m and velocities of up to between 1.0 and 2.0m/s. The hazard classification is 'Danger for some' along most of the road with some areas of 'Danger for most'. Within the 1% AEP plus 45% climate change and 0.1% AEP events depths increase to between 0.3m and 0.6m along the length of the road with a hazard classification of 'Danger for all' in places. Therefore, access and escape are likely to be impeded.

During the 0.1% AEP and 1% AEP plus 45% climate change events, a flow path across a road bridge on Hardingswood Road to the south of the site is shown to have depths of up to

0.90m in the 0.1% AEP event and up to 2.00m in the 1% AEP plus 45% climate change event. However, this road bridge, which crosses over a railway line, appears to have not been represented in the LiDAR. The elevation of the road either side of the road bridge is approximately 4m higher than that of the railway line. Therefore, It can be assumed that the flood depths of this road bridge will be similar to that on the rest of Hardingswood Road.

Safe access and escape will need to be demonstrated in the 1% AEP surface water and fluvial events, including an allowance for climate change. If safe access and escape cannot be provided, a Flood Warning and Evacuation Plan will be required, which considers the highly vulnerable nature of the proposed development. Given the highly vulnerable nature of the site, a policy of shelter in situ is unlikely to be appropriate.

5.3 Dry islands

The site is shown to be located on a dry island within the 1% and 0.1% AEP surface water events.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

- Groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site
- BGS data indicates that the underlying geology across most of the site is Ten-feet Rock which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
- 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 located within a Nitrate Vulnerable Zone. Therefore, early engagement with the LLFA and the EA is recommended to determine requirements for the site to manage the impact to surrounding watercourses. Consideration of water quality is likely to be of high importance and demonstrated through the use of the Simple Index Approach.
- The site is not located within a historic landfill site.
- The site is a brownfield site, and soils are identified to be restored soils mostly from quarry and opencast spoil. Soil contamination testing may need to be undertaken to determine whether infiltration is appropriate at the site.
- Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, helping meet requirements for the Nitrate Vulnerable Zone. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS

techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.

- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- 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.
- 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.

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 Gypsy and Traveller development as 'Highly Vulnerable'.

The exception test is currently shown to be required for this site because the northern extent of the site is located within Flood Zone 2. 'Highly vulnerable' development is not permitted in Flood Zone 3. However, as discussed in Section 2.3.2 the fluvial flood risk shown to this site within the EA FMfP is not reflective of the site topography and therefore a site-specific FRA may be able to show that the site is not at fluvial flood risk and as such the exception test is not required.

The site may however be at significant risk of groundwater flooding. Investigations will be required as part of a site-specific FRA to confirm the risk to the site. If a significant risk is present, the Local Planning Authority should satisfy themselves that the risk can be safely managed considering the highly vulnerable nature of the development, and that residents of the site will not be put at risk.

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 partially located within Flood Zones 2 and 3.
- Is shown to be at risk of surface water flooding.
- Is at high risk of groundwater emergence.

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

Guidance on the requirements for site-specific FRAs can be found in the accompanying Level 2 SFRA report.

Any development proposed adjacent to a canal should include a detailed assessment of how a canal breach would impact the site, as part of a site-specific FRA. Guidance on development near canals is available from the Canal & River Trust.

7.3 Guidance for site design and making development safe

Development should be steered outside of the northern, western and southern site boundaries where flood risk is the greatest.

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.

Given the high likelihood of groundwater emergence on the site, additional site investigation work may be required to support the detailed design of the drainage system. Infiltration may not be appropriate at the site but should be confirmed through site-specific assessment. Below ground development such as basements are not appropriate at this site.

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.

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.

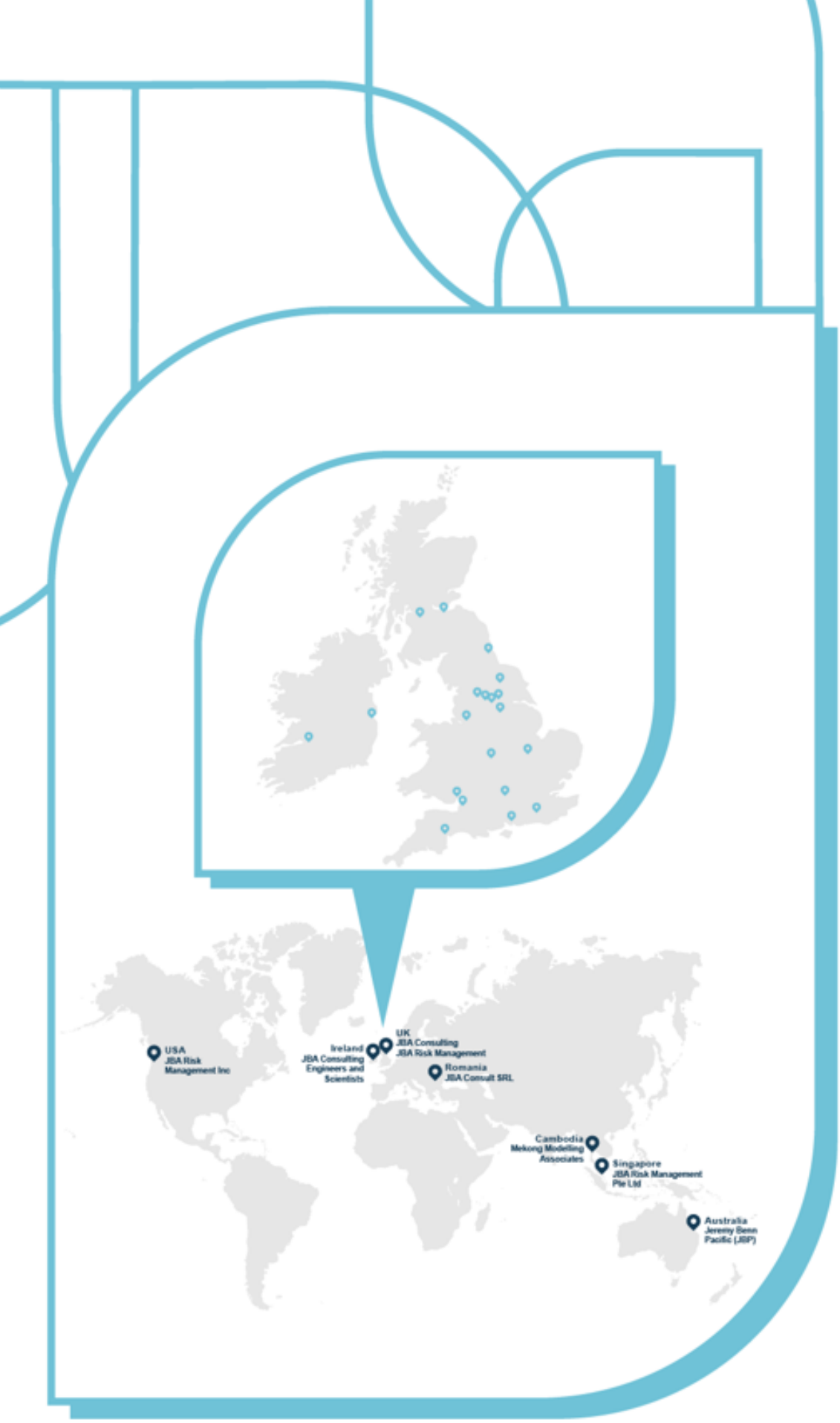
Any arrangements for access/escape and/or evacuation in the event of a flood must consider the highly vulnerable nature of the site.

8 Conclusions

The site is shown to be affected by fluvial flooding however, the fluvial flood risk shown within the EA FMfP does not appear to be representative of the underlying topography. The site is also shown to at risk of surface water flooding in all modelled surface water events, with the exception of the 1% AEP plus 45% climate change surface water event. Although the risk is minimal and confined to the northern, western and southern site boundaries, there is considerable surface water risk to the roads surrounding the site and safe access and escape cannot currently be demonstrated for the 1% AEP, 0.1% AEP, and 1% AEP plus 45% climate change events.

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

- Further assessment of the risk to the site should be undertaken within a site-specific FRA to refine the fluvial flood risk to the site. This site-specific FRA should either show that the site is not at fluvial risk or that the exception test can be passed.
- Further assessment of the surface water risk to the site should be undertaken within a site-specific FRA to refine the surface water flood risk to the site both in the present day and as a result of climate change due to the discrepancies between the local modelling in the EA RoFSW mapping and the climate change uplifts undertaken as part of the Level 1 SFRA. The release of the EA's NaFRA2 dataset should be utilised within the site-specific FRA.
- The site may be at significant risk of groundwater flooding. Investigations will be required as part of a site-specific FRA to confirm the risk to the site. If a significant risk is present, the Local Planning Authority should satisfy themselves that the risk can be safely managed considering the highly vulnerable nature of the development, and that residents of the site will not be put at risk.
- Safe access and escape should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Currently this assessment cannot demonstrate safe access and escape within the 1% AEP, 0.1% AEP, and 1% AEP plus 45% climate change events.
- 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.



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