Sheffield Level 2 Strategic Flood Risk Assessment Update - Site S02898

Final

May 2025

Prepared for:

Sheffield City Council

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Prepared by	Freya Nation BSc Analyst
Reviewed by	Mike Williamson BSc MSc CGeog FRGS EADA Principal Analyst
Authorised by	Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM Associate Director

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Contract

JBA Project Manager	Mike Williamson
Address	Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX
JBA Project Code	2025s0137

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Acknowledgements

We would like to thank the Environment Agency for their assistance with this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the Sheffield City Council (SCC) Local Plan Site S02898. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'SCC Level 1 SFRA' (2022) and read the 'SCC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site S02898

- Location: Land to the south of White Lane, S12 3HS
- Existing site use: Mixed use agricultural land and farmhouse / buildings
- Existing site use vulnerability: More vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 13.4 ha
- Proposed development impermeable area: 8.6 ha
- Watercourse: Robin Brook ordinary watercourse
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

Figure 1-1: Existing site location boundary

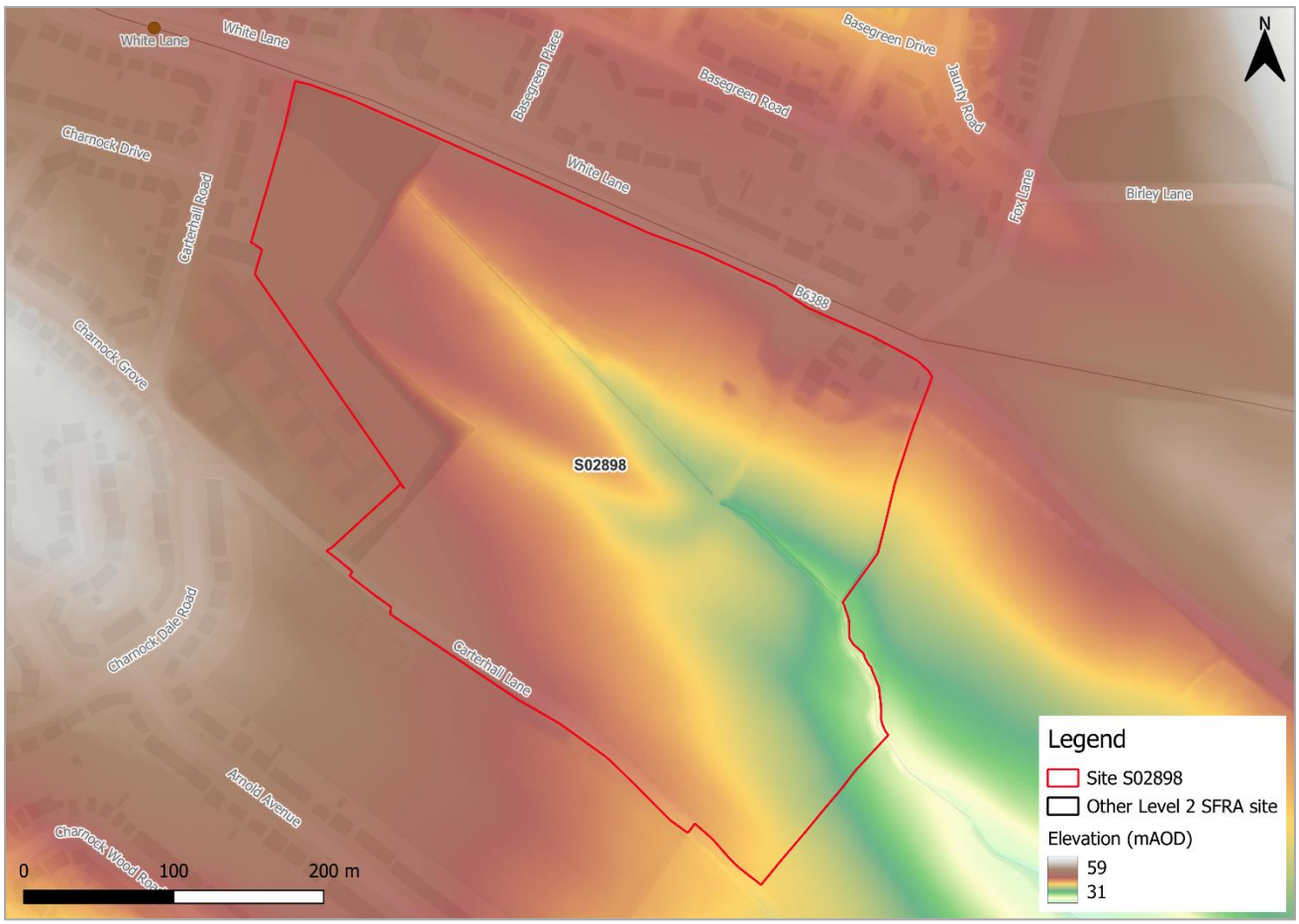

Figure 1-2: Topography

Figure 1-3: Soils and geology

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (February 2025) and Flood Zone 3b (functional floodplain), as updated in the Level 2 SFRA finalised in 2024, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is entirely located within Flood Zone 1 indicating it is at low risk of flooding from rivers. OS mapping and topography data indicates that there is an unmodelled watercourse present within the site, namely Robin Brook. Section 2.1.2 discusses the potential risk to the site from this ordinary watercourse, using the third generation Risk of Flooding from Surface Water (RoFSW) dataset as a proxy to inform this.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

Flood Zone 1 (% area)	Flood Zone 2 (% area)	Flood Zone 3a (% area)	Flood Zone 3b (% area)
100	0	0	0

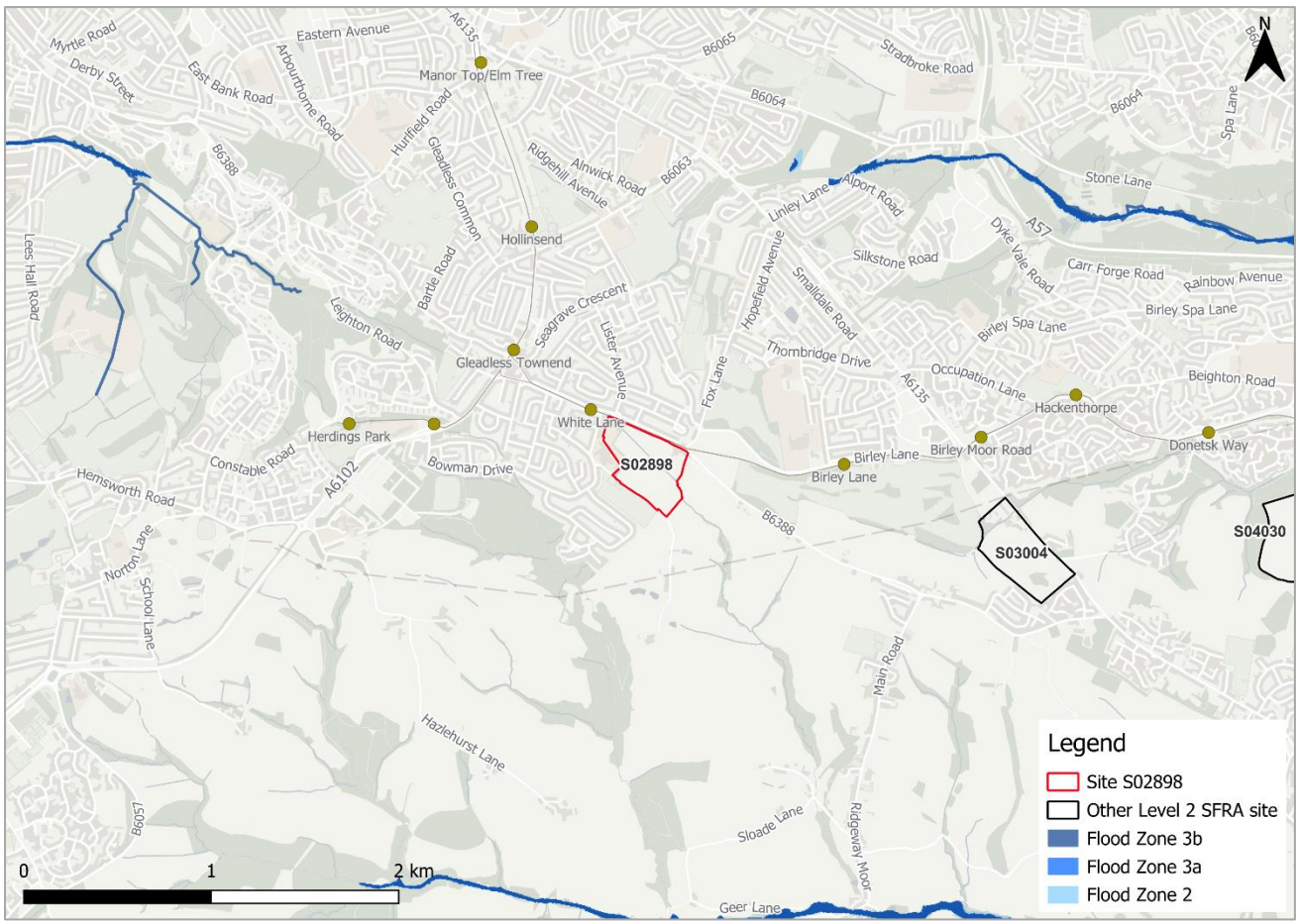

Figure 2-1: Existing risk from rivers to the site

2.1.2 Unmodelled watercourse risk

As documented in Section 2.1.1, Robin Brook is present within the site. There is no existing model for this ordinary watercourse, therefore risk is unknown. Given the timescales for the local plan, modelling of this watercourse to inform this SFRA will not be feasible. Therefore, the 0.1% AEP event of the third generation RoFSW dataset is used as a proxy to inform on potential risk, as shown on Figure 2-2. Risk is modelled to remain largely confined to the areas immediately adjacent to the channel. Any site-specific FRA should develop a model of Robin Brook to fully understand the onsite fluvial risk.

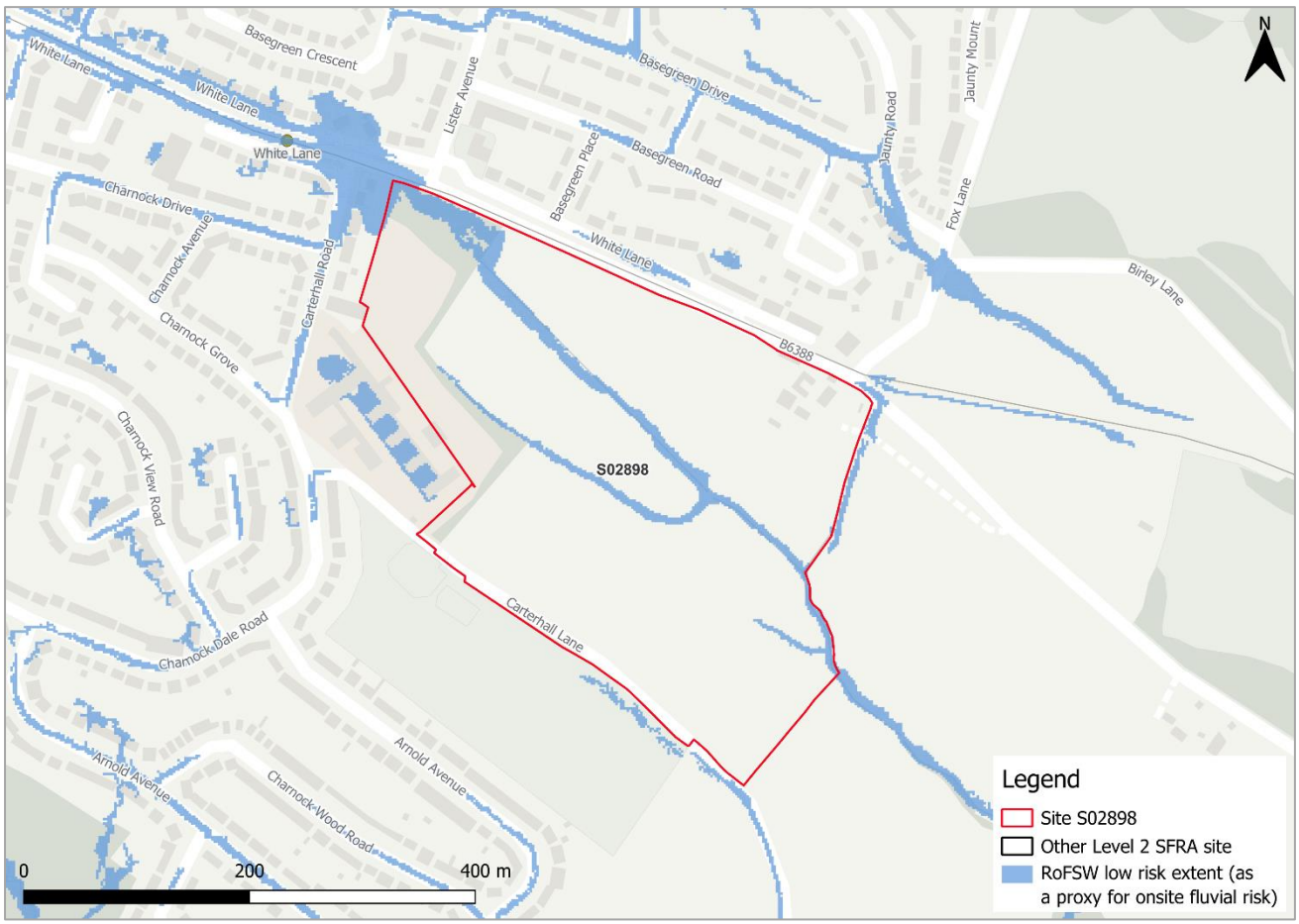

Figure 2-2: Low risk event surface water flood extent (Risk of Flooding from Surface Water map) as a proxy for onsite fluvial risk

2.2 Impacts from climate change

The impacts of climate change on flood risk from Robin Brook have not been modelled for this SFRA, as a model covering the ordinary watercourse is not available. The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Any site-specific FRA should produce a detailed model of Robin Brook and include for the most up to date climate change allowances.

2.3 Flood risk management

2.3.1 Flood defences

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) that may help to reduce flood risk to the

site and surrounding areas. Downstream of, and within the site, along Robin Brook mapping shows potential for riparian woodland planting and runoff attenuation features (Figure 2-3). Riparian woodland can slow down and hold back flood flows within watercourses, reducing flood risk downstream. It can also reduce sediment delivery and bankside erosion. Runoff attenuation features can delay and flatten the hydrograph and reduce peak flow locally for small flood events by intercepting, slowing and filtering surface water runoff. Further investigation is required for any land shown to have potential for WwNP.

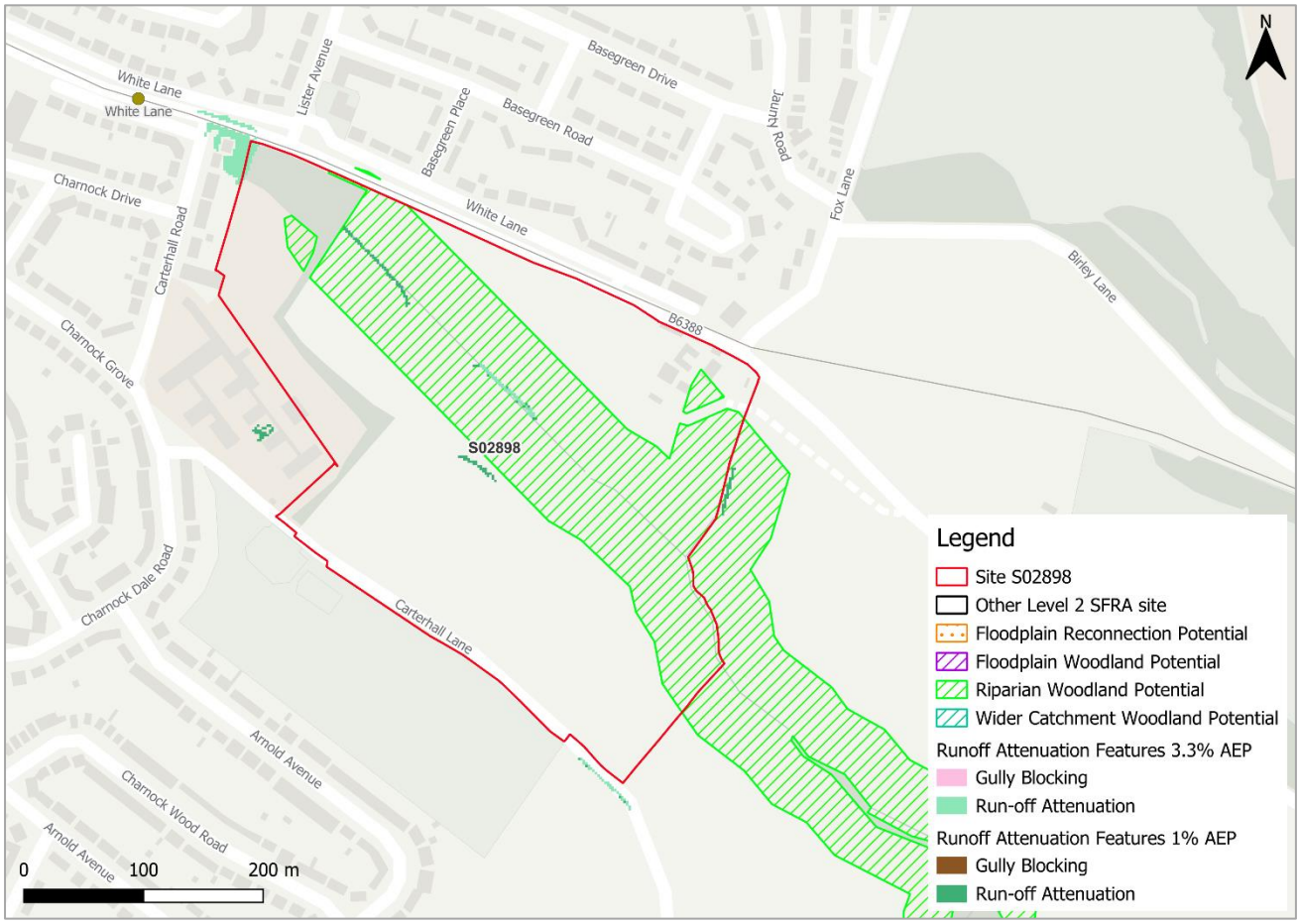

Figure 2-3: NFM potential mapping

2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) has been considered. The site is not recorded to have experienced historic flooding.

2.5 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be

issued when there is less confidence that flooding will occur in a FWA. The site is not located within a FAA.

Based on available information, safe access and escape routes should be achievable via White Lane to the north or Carter Hill Lane to the south.

2.6 Observations, mitigation options and site suitability - fluvial

- The site is wholly located within Flood Zone 1 and is therefore modelled to be at low risk of flooding from rivers.
- Potential flood risk from Robin Brook, which originates within the site and flows southeasterly through the site, may need to be ascertained through modelling, at the FRA stage. No development should take place within 8m either side of the watercourse which should be included in site design as a blue green corridor.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale third generation Risk of Flooding from Surface Water (RoFSW) map (November 2023), surface water risk to the site is predominantly very low. Approximately 2% of the site is at high surface water risk. A further 1% of the site is at medium risk and a further 5% is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is largely confined to Robin Brook, through the centre of the site and along the southeastern site boundary. There is also an area of ponding within a topographic low spot at the northwestern corner of the site. In the medium risk event, a second flow path forms perpendicular to the Robin Brook flow path, at the centre of the site. Ponding at the northwestern site corner expands marginally. In the low risk event, ponding at the northwestern corner expands further and, along with the second flow path perpendicular to Robin Brook, joins the Robin Brook flow path to form a larger flow path which crosses the site diagonally.

Greatest surface water depths in the medium risk event are > 1.2 m (Figure 3-1) with some areas of extreme hazard (Figure 3-2). During the extreme event, safe access and escape routes should remain achievable via White Lane to the north of the site, travelling east, or via Carter Hall Lane to the south, travelling north.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

Very low risk (% area)	Low risk (% area)	Medium risk (% area)	High risk (% area)
92	5	1	2

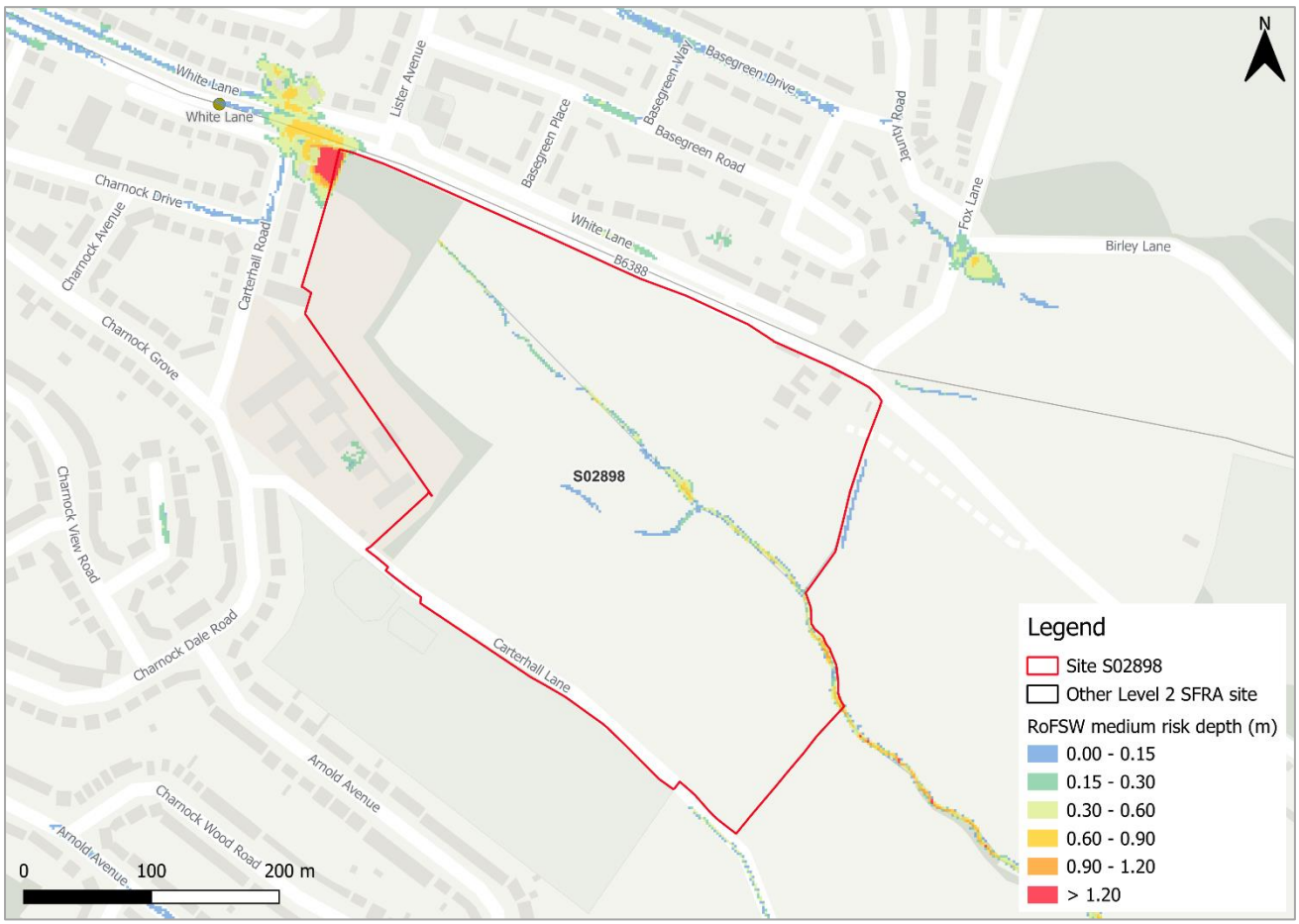

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Don and Rother management catchment

Return period	Central allowance 2070s (% increase)	Upper end allowance 2070s (% increase)
3.3% (high risk)	25%	35%
1% (medium risk)	25%	40%

1 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3 shows the modelled surface water flood depths for the medium risk event plus 40% climate change. Risk is modelled to be greater than present day conditions, with the medium risk climate change event modelled to be similar to the present day low risk event. Maximum flood depths are modelled to remain > 1.2 m, with further areas of extreme hazard (Figure 3-4). Safe access and escape routes may remain achievable via White Lane to the north of the site, travelling east and via Carter Hall Lane to the south of the site, travelling north.

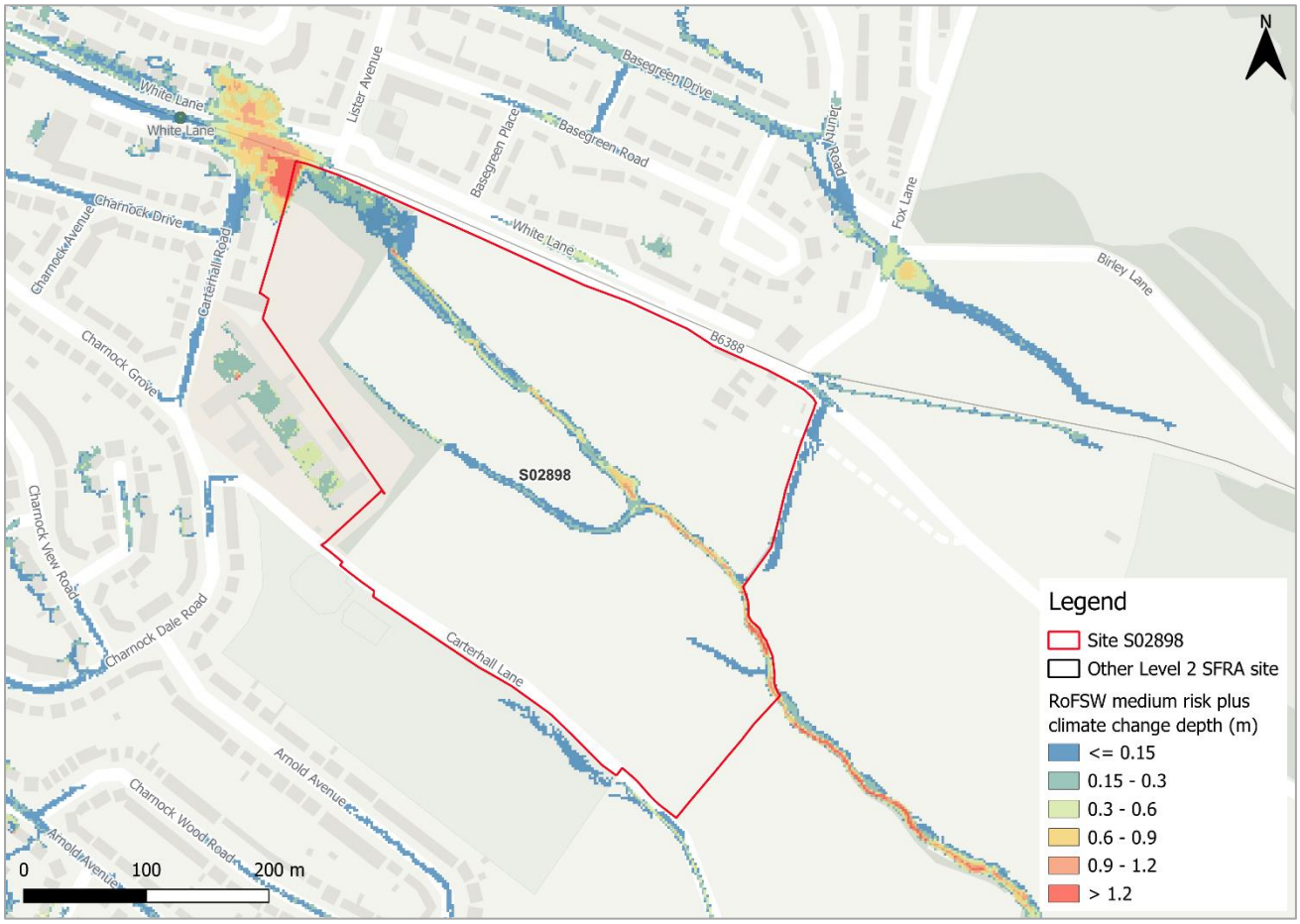

Figure 3-3: Medium risk event surface water flood depths plus 40% climate change (based on Risk of Flooding from Surface Water map)

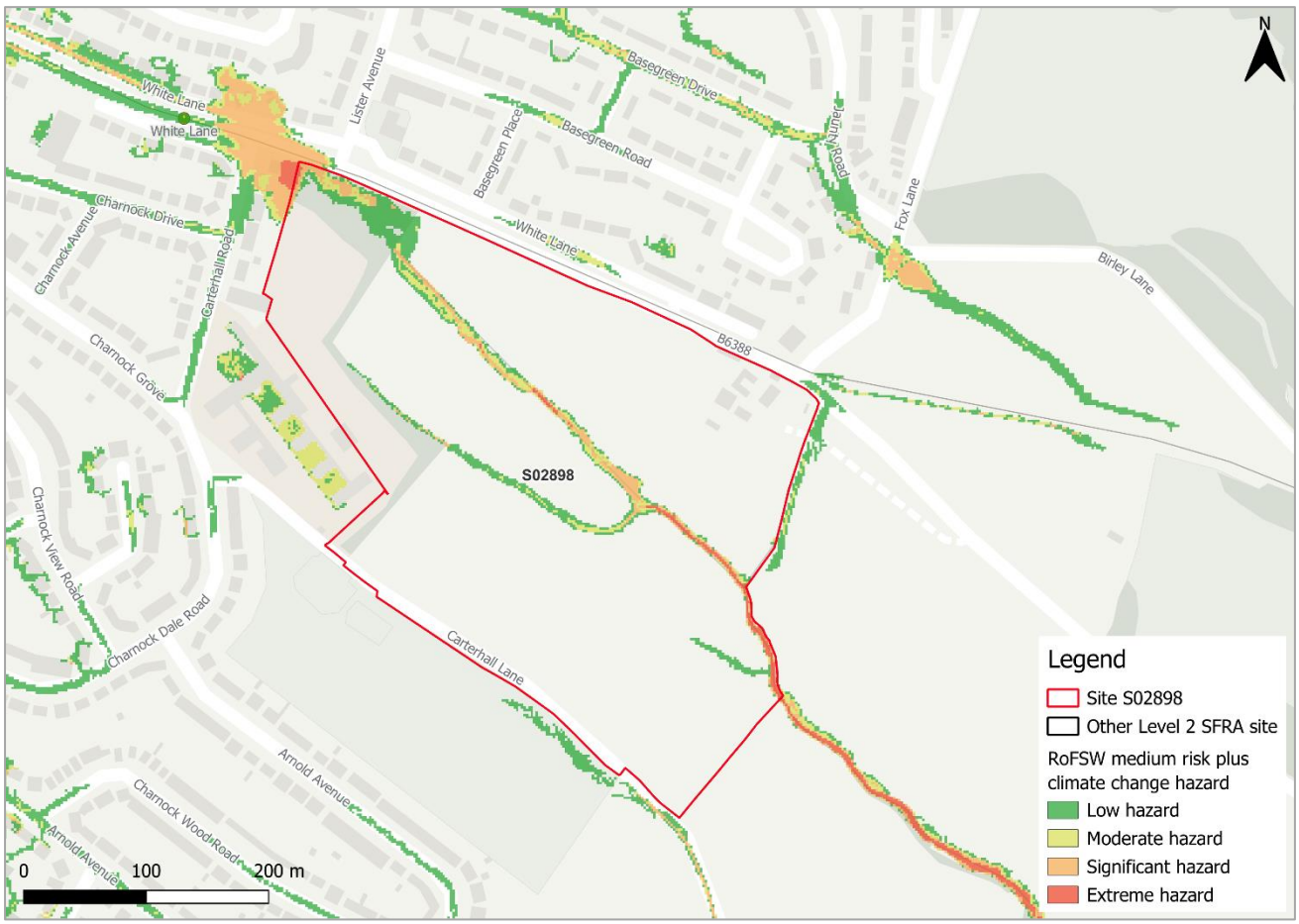

Figure 3-4: Medium risk event surface water flood hazards plus 40% climate change (based on Risk of Flooding from Surface Water map)

3.3 Risk of runoff from site post development

Runoff rates should not exceed current rates and if possible, betterment of existing rates should be aimed for. For the purposes of this assessment, the required volumes of attenuation have been calculated below based on the estimated impermeable area (assumed 85% of site area where this information was not available) and limiting greenfield runoff rate of Qbar (l/s).

Table 3-3: Surface water flood risk from proposed development

Design flood event (incl climate change)	Critical storm duration Hrs	Inflow volume m^3	Outflow volume m^3	Attenuation required m^3	Time to empty (assuming no infiltration) Hrs	Total storage required: Area (Ha) and % of site area
30yr Rainfall+25%	12	9682	883	8799	119.3	0.59 Ha 4.4%
30yr Rainfall+35%	12	10456	883	9574	129.8	0.64 Ha 4.8%
100yr Rainfall+25%	12*	23209	8827	14382 (5583 exceedance storage)	195.0	0.96 Ha 7.1%
100yr Rainfall+40%	12*	25994	8827	17167 (7594 exceedance storage)	232.7	1.14 Ha 8.5%
Surface water flood risk impacts from development site, mitigation & SuDS options	As part of this Level 2 SFRA we have included calculations to provide an estimated land take if a pond with an assumed depth of 1.5m was included as part of the development. Attenuation volumes are presented for the critical storm duration for the 3.33% AEP event with exceedance flows quantified up to the 1% event. To prevent development worsening flood risk elsewhere, surface water runoff must be managed on site.					
*critical storm duration limited to 12 hours						

Note: Proposed development limiting runoff rate: (l/sec). Qbar (FEH Statistical) – 29.19 (assume 5l/s minimum discharge), Q30 – 51.08, Q100 – 60.71.

3.4 Observations, mitigation options and site suitability - surface water

- Current and future risk are confined to existing channels. These channels should be kept in place and remain unobstructed. They should be maintained and included within the design of the development.
- Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development. A drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This may require surface water modelling based on layout plans and detailed design and consultation with the LLFA.
- For the 1% AEP event plus 40% climate change, approximately 8.5% of the total area of the site would be required for flood storage based on a 1.5m deep pond to ensure runoff volumes do not exceed existing rates.

- The drainage strategy should consider the surrounding roads and access routes in terms of drainage capacities, network conditions and maintenance.
- The NaFRA2 release of the RoFSW should be considered at the FRA stage.
- Note that the RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications.

The northern half, and part of the southern half of the site are within an area where there is no risk of groundwater emergence. There are two strips of land at the centre of the site and along the southern site boundary where flooding from groundwater is not likely. Therefore, infiltration SuDS may be suitable across the whole site.

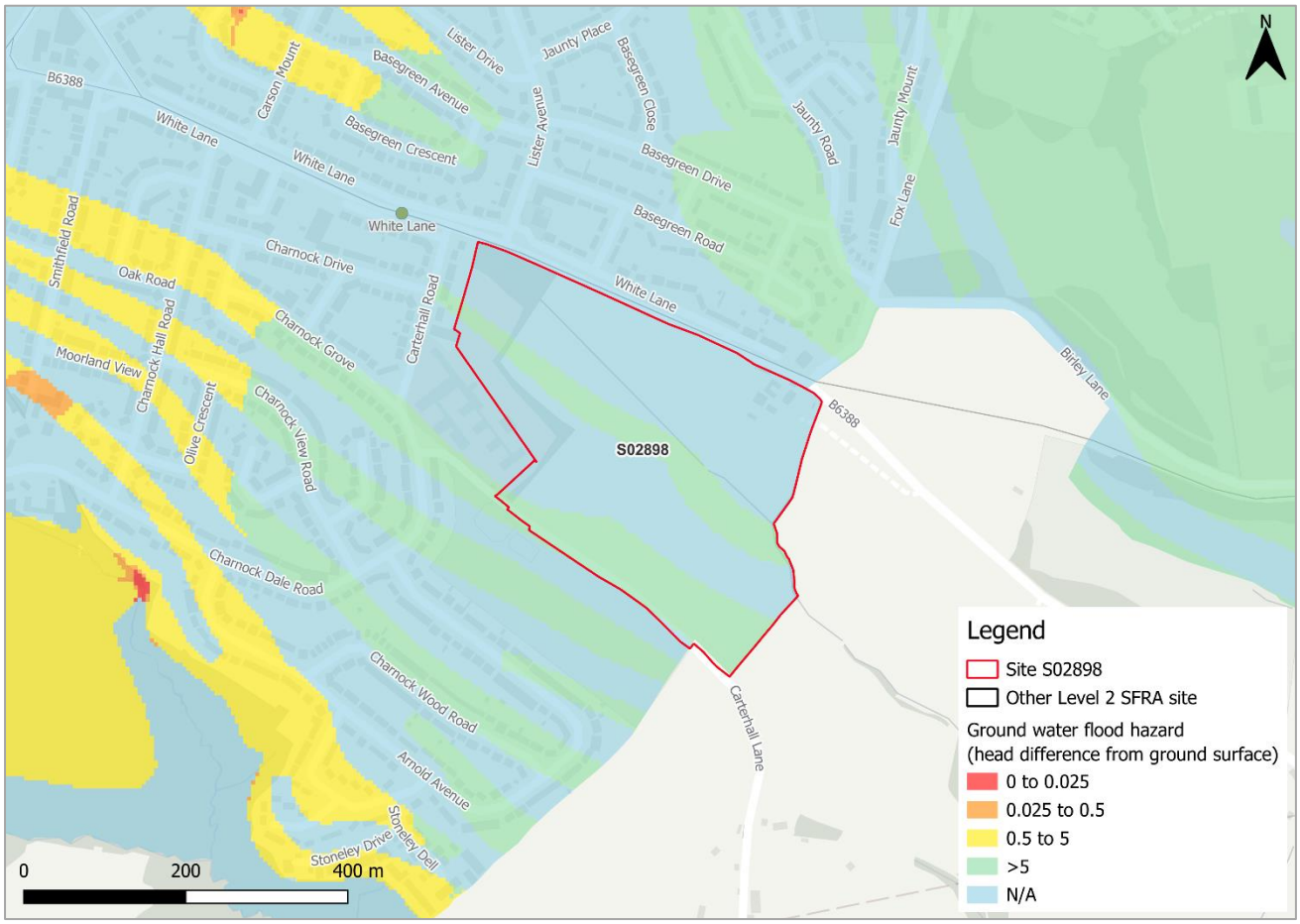

Figure 4-1: JBA 5m Groundwater Emergence Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone 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.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Residual risk

5.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is not modelled to be at risk of reservoir flooding.

5.2 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.

6 Overall site assessment

6.1 Can part b) of the exception test be passed?

This site is not required to pass part b) of the exception test[3] as it is located within Flood Zone 1, however it must still be proven that the development can be safe for its lifetime, which is 100 years for residential development.

6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2022) and this Level 2 SFRA:

- It should be possible to allocate this site given its location within Flood Zone 1.
- However, unmodelled Robin Brook flows through the site. Potential flood risk from the brook may need to be ascertained through appropriate modelling at the FRA stage. No development should take place within 8m either side of the watercourse which should be included within a blue green corridor.
- A drainage strategy should ensure runoff remains onsite and existing flow paths are maintained in site design.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the SCC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

3 Para 178 National Planning Policy Framework 2024

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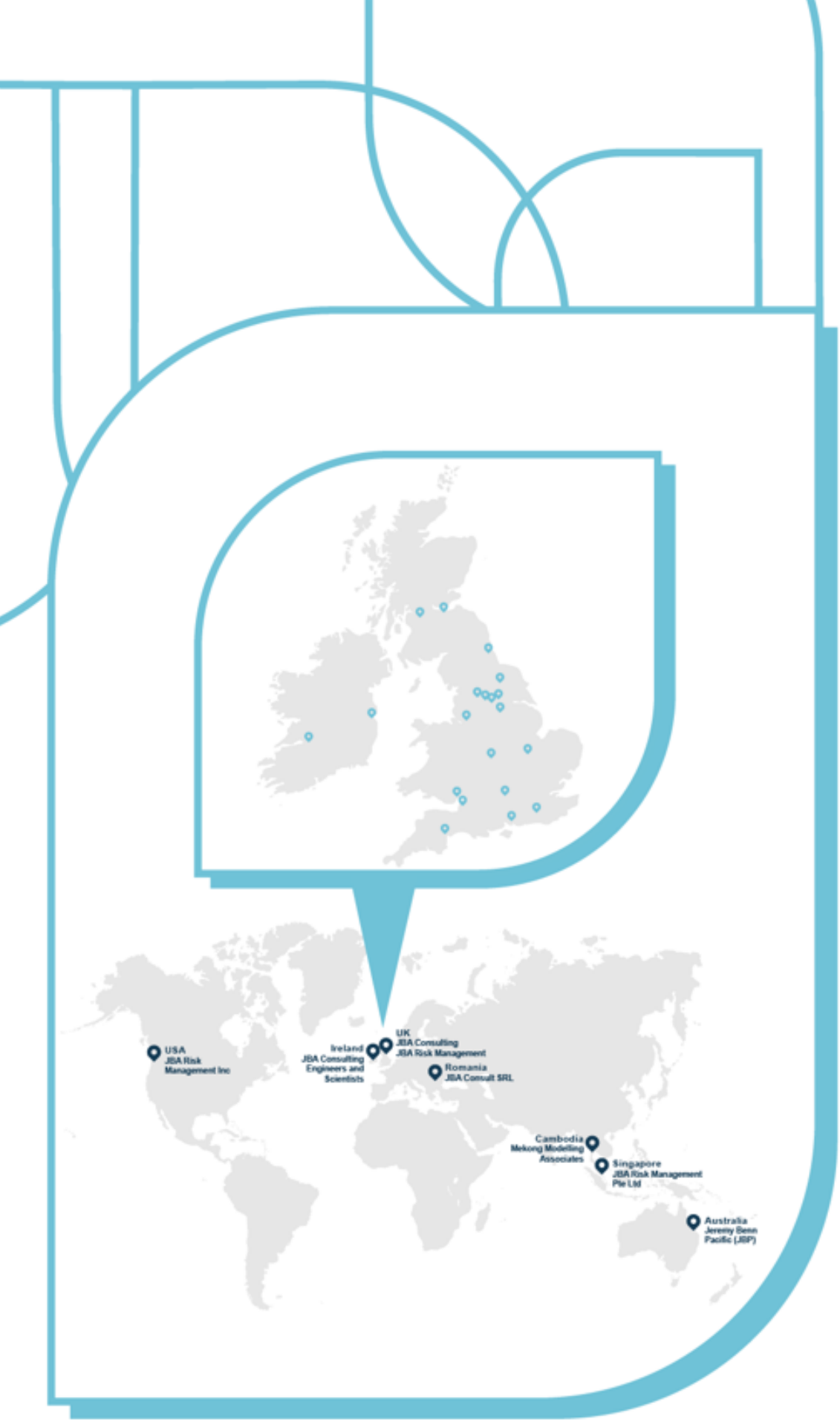

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