Sheffield Level 2 Strategic Flood Risk Assessment Update - Site S03051

Final

May 2025

Prepared for:

Sheffield City Council

www.jbaconsulting.com

Document Status

Issue date	6 May 2025
Issued to	Chris Hanson
BIM reference	OZZ-JBA-XX-XX-RP-Z-0017
Revision	P03
Prepared by	Laura Thompson 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

Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

Contract

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

This report describes work commissioned by Sheffield City Council (SCC) by an instruction dated 23 January 2025. The Client's representative for the contract was Chris Hanson of SCC. Laura Thompson of JBA Consulting carried out this work.

Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of SCC and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Sheffield City Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between January and May 2025 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

JBA disclaims any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to JBA's attention after the date of the Report.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. JBA specifically does not guarantee or warrant any estimates or projections contained in this Report.

Acknowledgements

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

Contents

List of Figures

List of Tables

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the Sheffield City Council (SCC) Local Plan Site S03051. 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 S03051

- Location: Land south of Wheel Lane between Creswick Avenue and Wheel Lane, S35
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 16.8 hectares
- Proposed development impermeable area: 11.2 hectares
- Watercourse: Unnamed ordinary watercourse (unmodelled)
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Assessment of modelled fluvial flood depths, velocities and hazards
    - Assessment of the potential risk from the unmodelled watercourse
    - 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
    - Assessment of potential residual risk from the onsite culvert

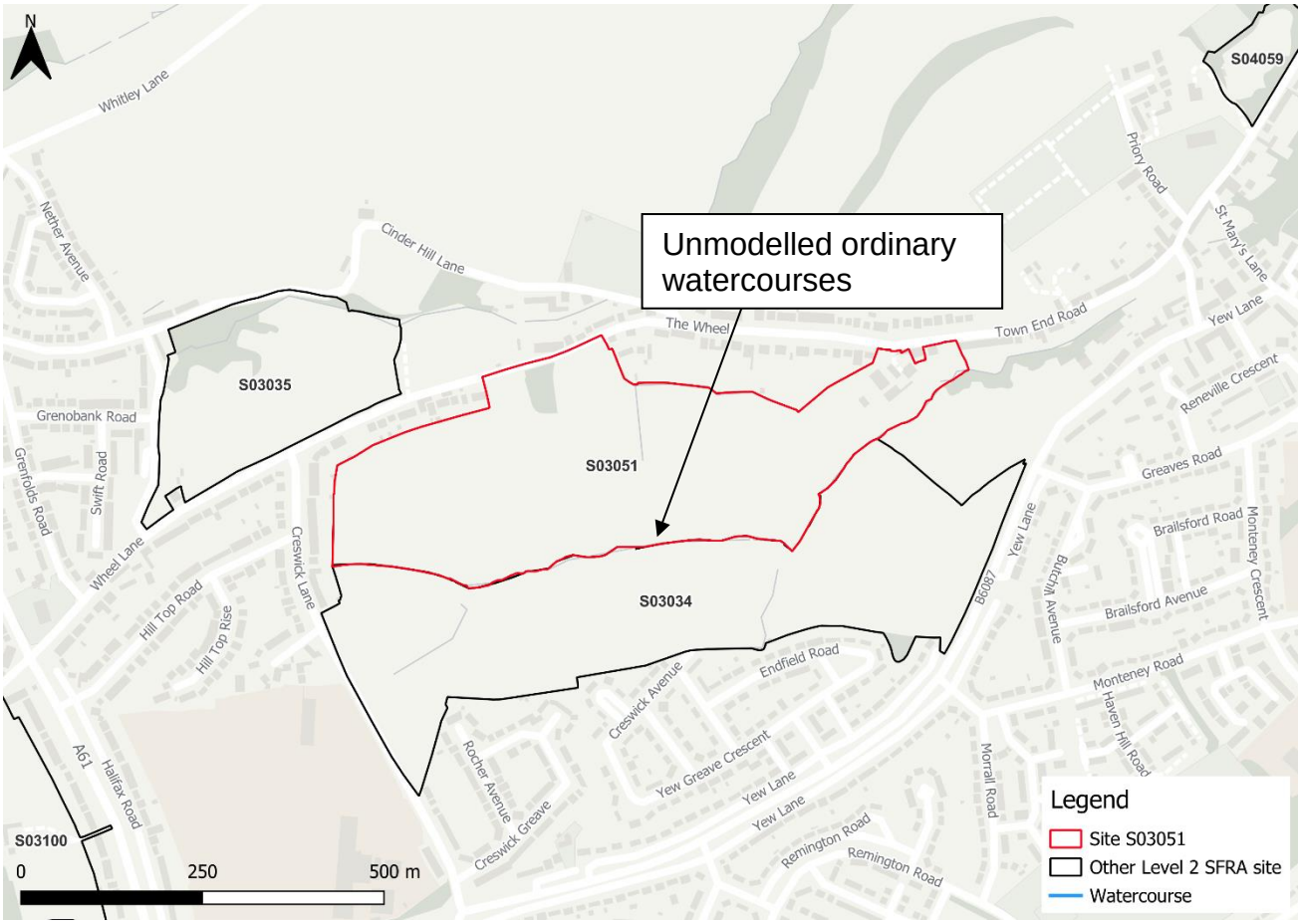


Figure 1-1: Existing site location boundary

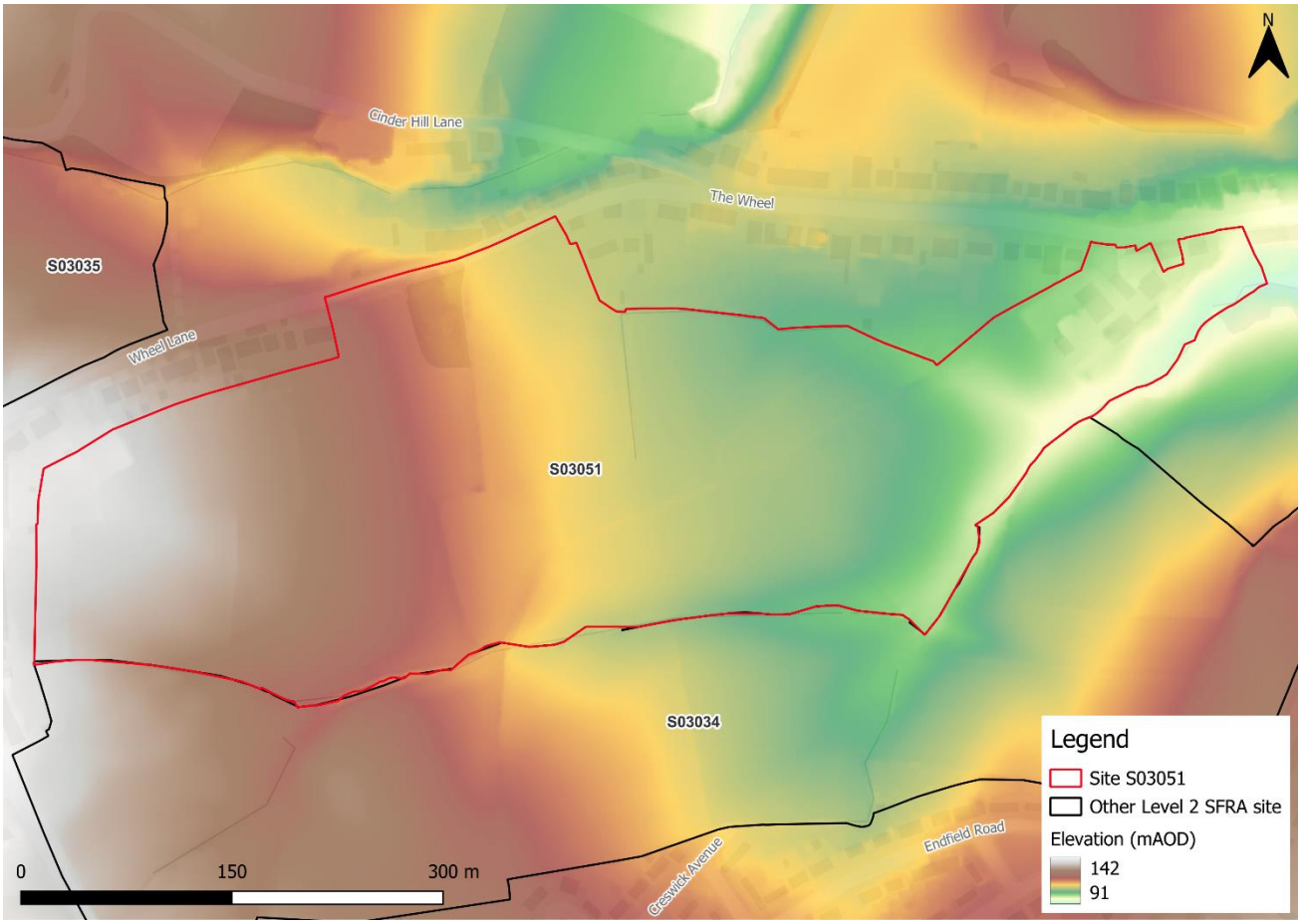


Figure 1-2: Topography

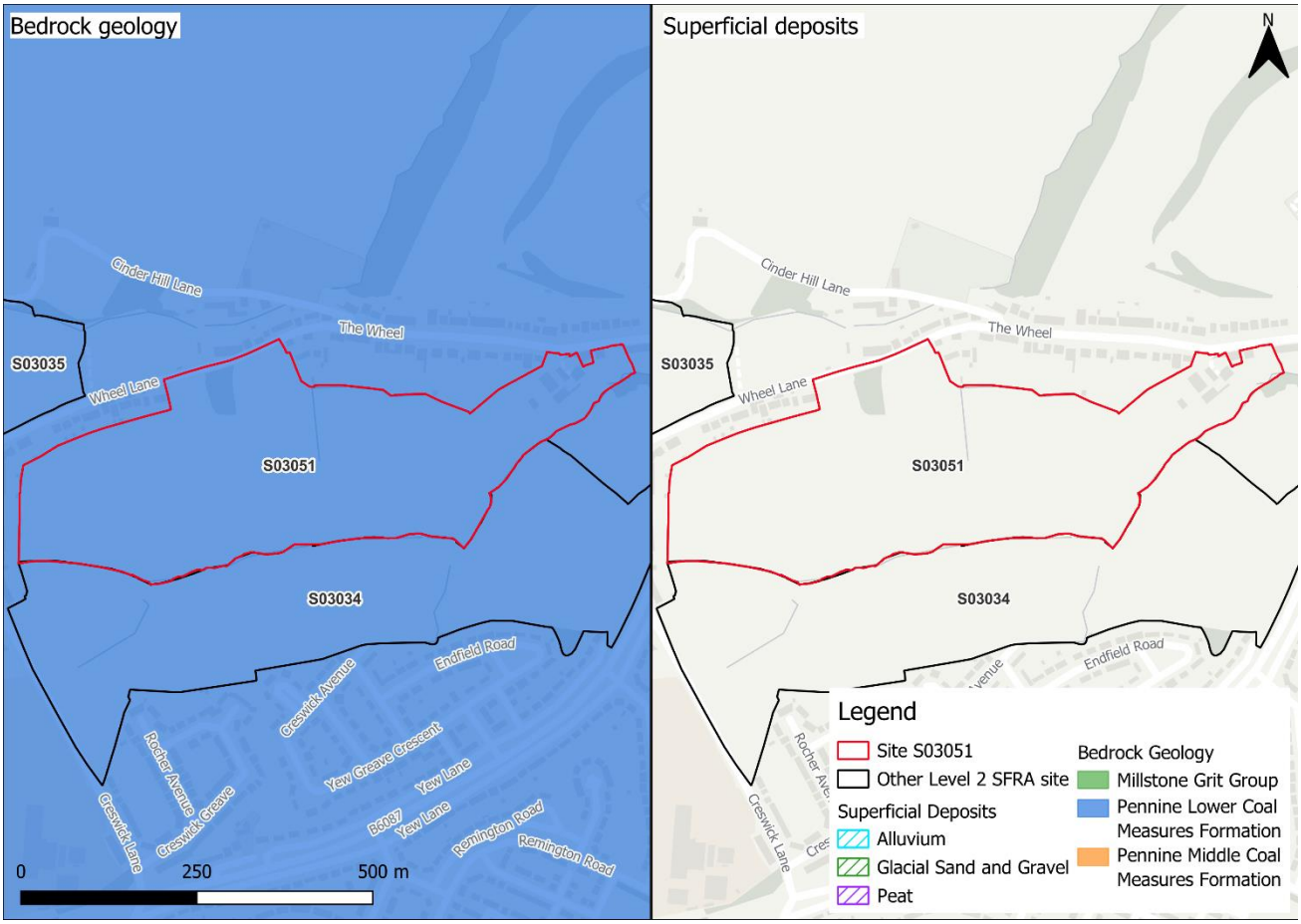


Figure 1-3: Soils and geology

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 2.3) or the impacts of climate change (Section 2.2).

Fluvial risk to the site comes from the unnamed ordinary watercourse which runs along the southern site boundary. This ordinary watercourse appears to be a tributary of Blackburn Brook to the east. The area of functional floodplain onsite is part of the ordinary watercourse and is based on Flood Zone 3 of the Flood Map for Planning. There should be no built development within the functional floodplain. Section 2.1.2 discusses the potential risk to the site from the unmodelled reaches of the ordinary watercourse, using the third generation Risk of Flooding from Surface Water (RoFSW) dataset as a proxy to inform this.

OS mapping and topography data indicates that there is also a drainage ditch present onsite, originating within the centre of the site flowing northwards and then along the northern site boundary.

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)
99	0	0	1

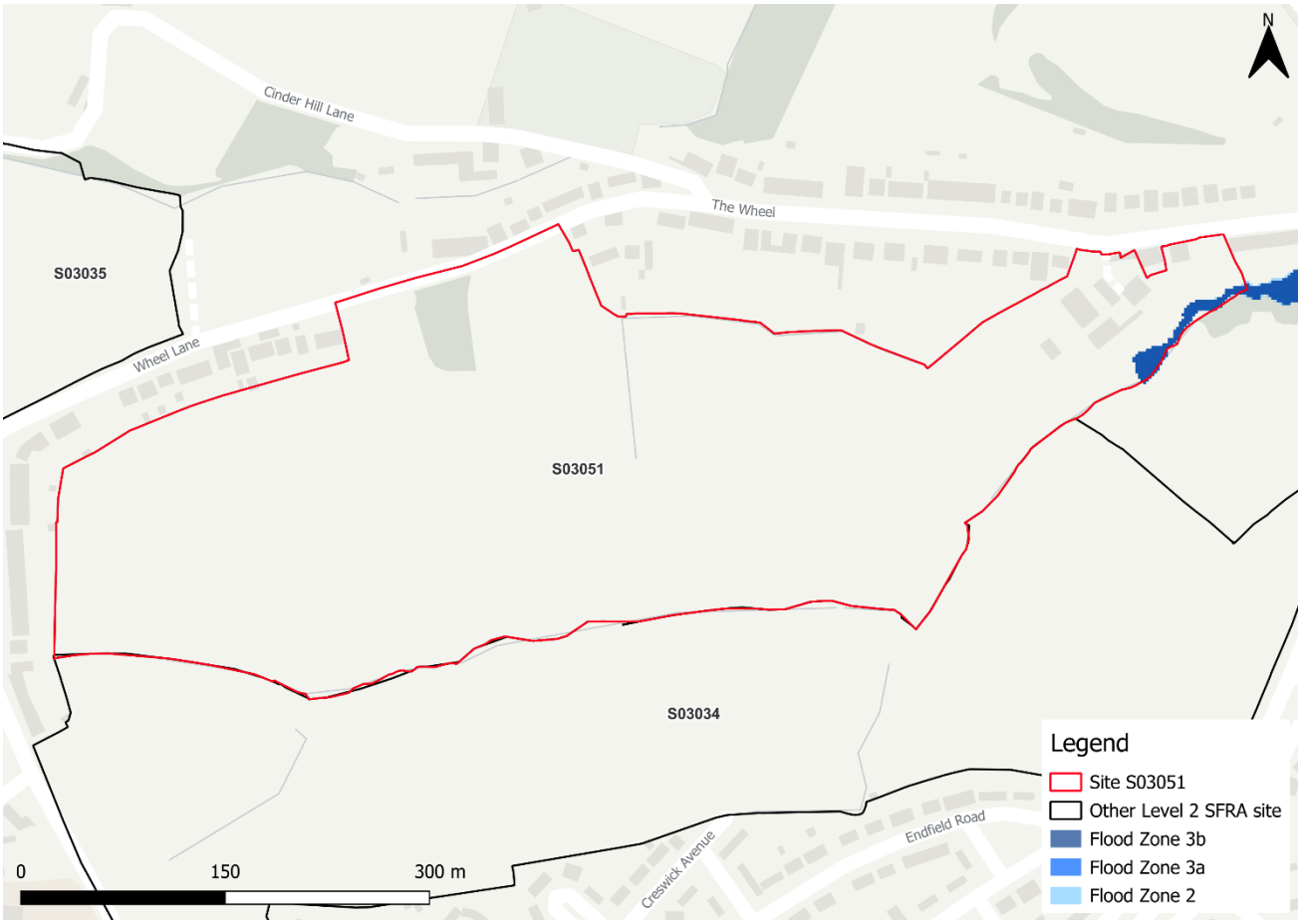


Figure 2-1: Existing risk from rivers to the site

2.1.2 Blackburn Brook 2018 undefended model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. There is no modelled risk to the site from the Blackburn Brook model in this event. This indicates the model does not include the unnamed watercourse along the southern boundary of the site and that Flood Zone 3 of the Flood Map for Planning in this location is based on national generalised modelling and not a detailed model.

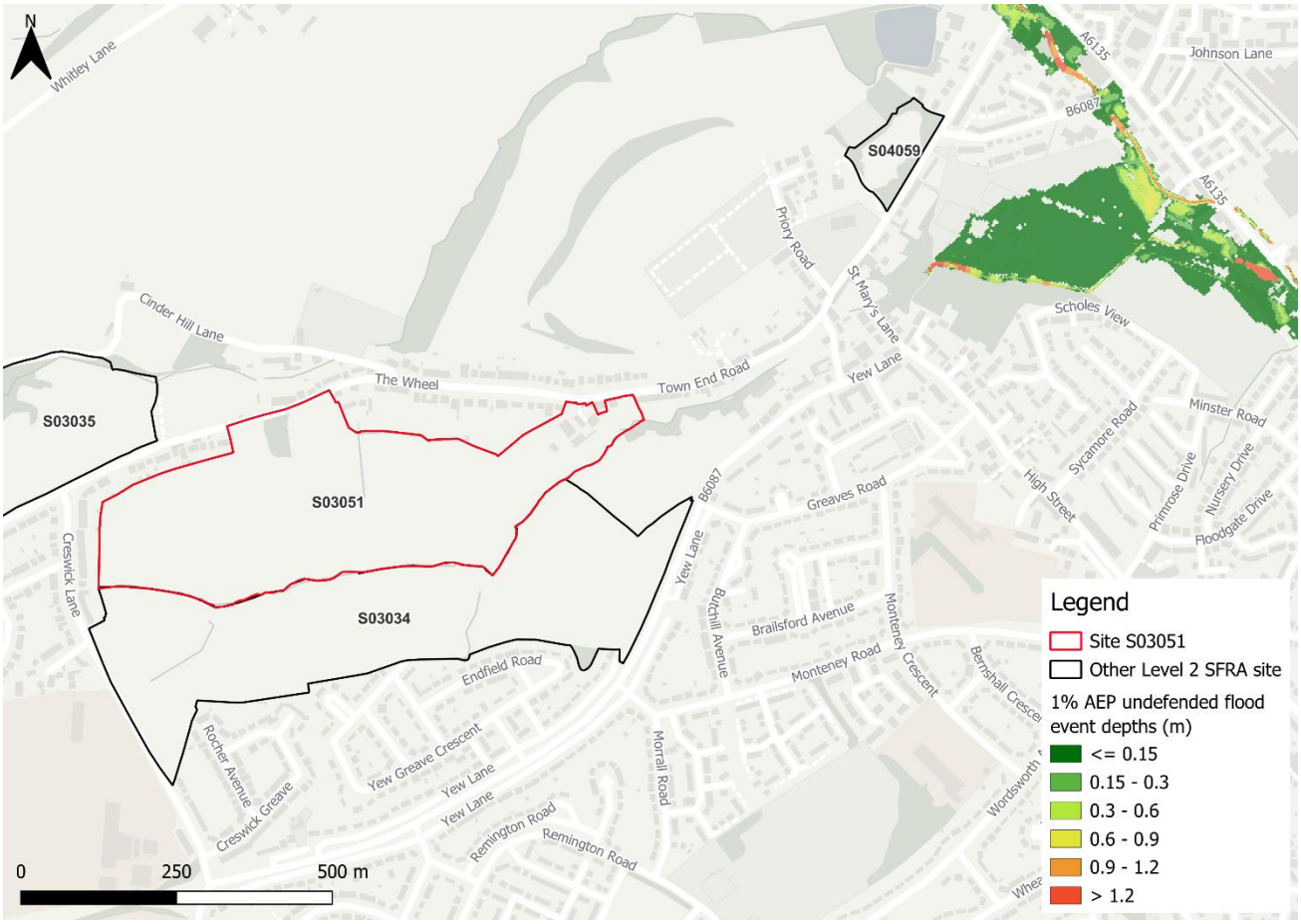


Figure 2-2: Flood depths for 1% AEP undefended flood event

2.1.3 Unmodelled ordinary watercourse risk

As documented within Section 2.1.1, an unmodelled watercourse is present along the southern boundary of the site. There is no existing detailed model for this watercourse, there the fluvial risk it poses to the site is currently unknown. Given the timescales for the local plan, new modelling for this watercourse to inform this SFRA is not feasible. Therefore, the 0.1% AEP event of the third generation RoFSW dataset will be used as a proxy to inform this risk, as shown in Figure 2-3. Risk is shown to not extend far from the channels and therefore should be included within site design as a blue green corridor. There is an additional flow path extending between the north and south of the site in the east. A site-specific FRA should model the ordinary watercourse to fully understand the onsite fluvial risk.

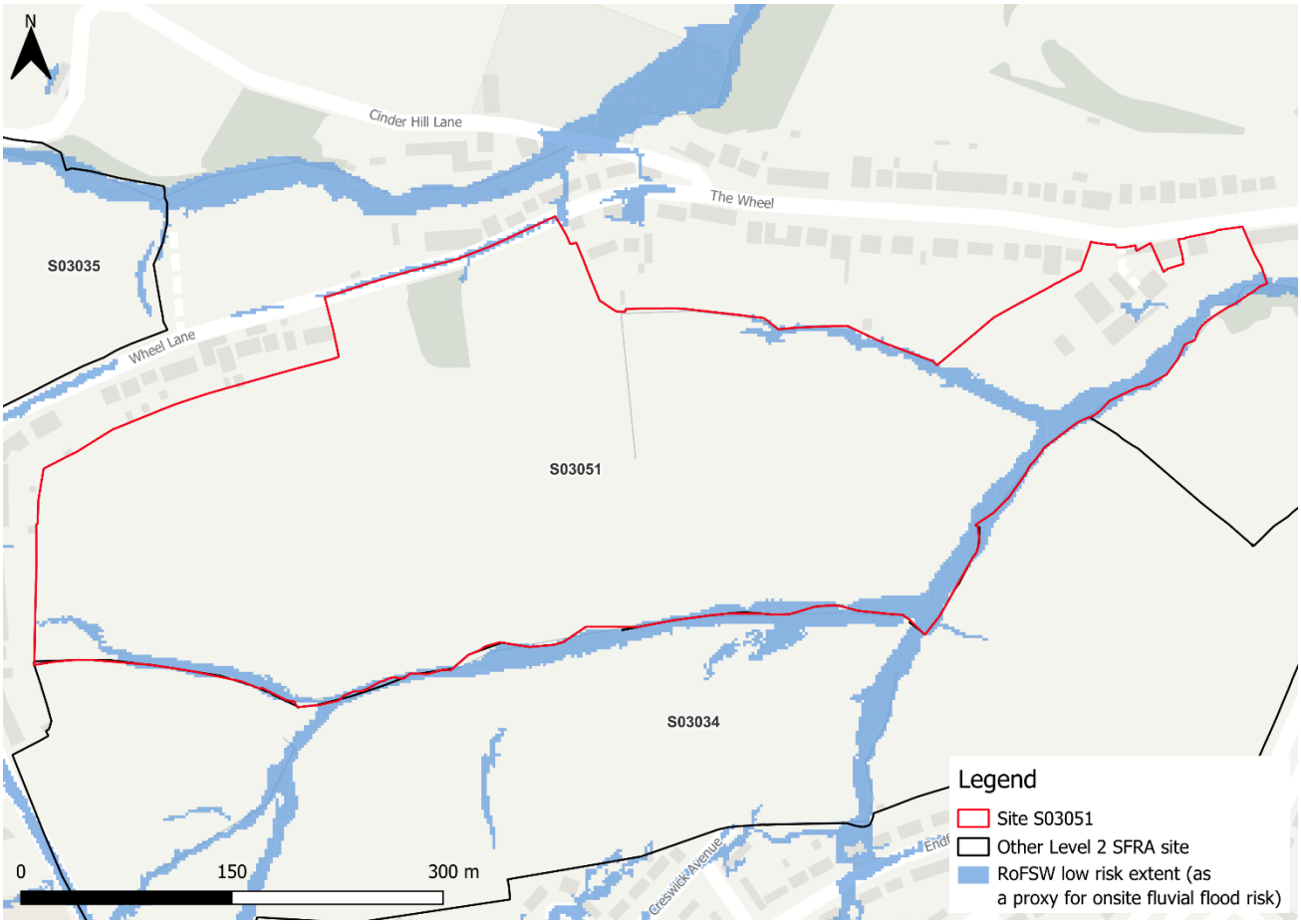


Figure 2-3: Low risk event surface water flood extent (Risk of Flooding from Surface Water map) as a proxy for onsite fluvial risk

2.2 Impacts from climate change

The impacts of climate change on flood risk from the ordinary watercourse have not been modelled for this SFRA, as a model covering the 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 the watercourse 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. Within the site, there are opportunities for riparian woodland planting to attenuate flooding. There is also potential for runoff attenuation features which indicate areas where enhanced storage may be achievable. These areas are shown in Figure 2-4. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

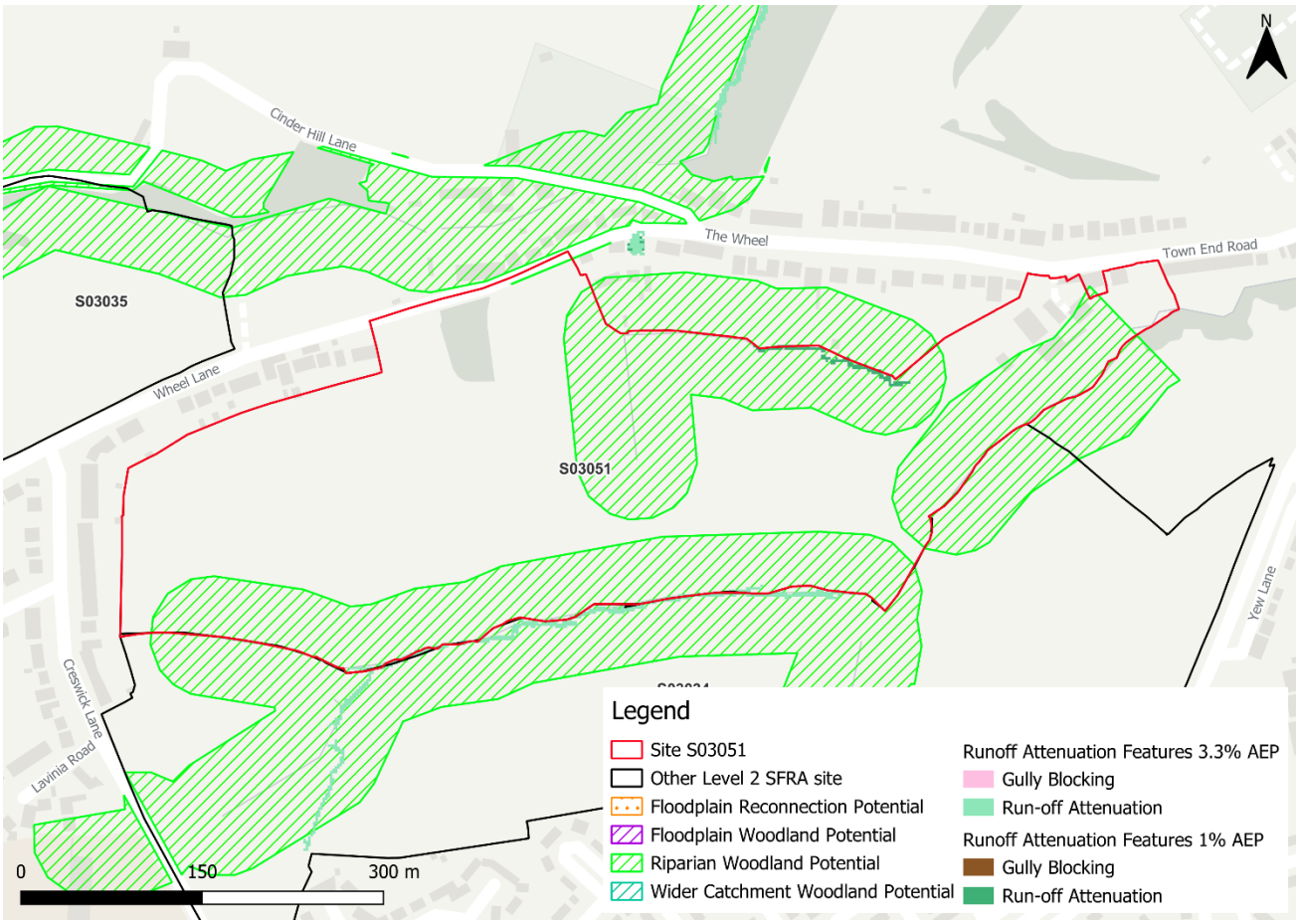


Figure 2-4: Natural Flood Management (NFM) potential mapping

2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood events at the site.

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 would likely be achievable via The Wheel to the north of the site during a fluvial flood event.

2.6 Observations, mitigation options and site suitability - fluvial

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the FRA must show that the development can be designed to be safe and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- The site is located partially within the functional floodplain along the far southeastern boundary. Development is not permitted within the functional floodplain.
- The extent of fluvial risk from the unmodelled watercourse is currently unknown. Using the 0.1% AEP surface water event as a proxy, risk is modelled to remain largely confined to the areas immediately surrounding the channel. Any site-specific FRA should develop a model of the unnamed watercourse to fully understand the onsite fluvial flood risk both now and in the future.
- The channel and risk areas of the ordinary watercourse should be included in a blue green corridor which can provide multifunctional benefits providing ecological, social and amenity value. There should be no development within 8 metres of the channel banks.
- Were development of this site to proceed, given the proximity of this site to neighbouring site S03034 it would be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for sustainable development is in place.

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 4% of the site is at high surface water risk. A further 2% of the site is at medium risk and a further 2% is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is confined to the channel of the unnamed watercourse along the southern site boundary. In the medium risk event, there is a surface water flow path extending along the northern boundary and through the east of the site. This is consistent with the low risk event, however flow paths are greater in extent and there is an additional area of ponding within a topographic low spot in the northeast of the site.

Greatest flood depths within the site in the medium risk event are between 0.9 and 1.2 m (Figure 3-1), however these depths are located within the channel along the southern boundary of the site. Maximum depths outside of the channel are < 0.15 m. Modelled flood hazard onsite, outside of the channel, is largely categorised as 'low' (Figure 3-2).

Safe access and escape routes would likely be achievable via The Wheel to the north of the site in all events.

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	4	2	2

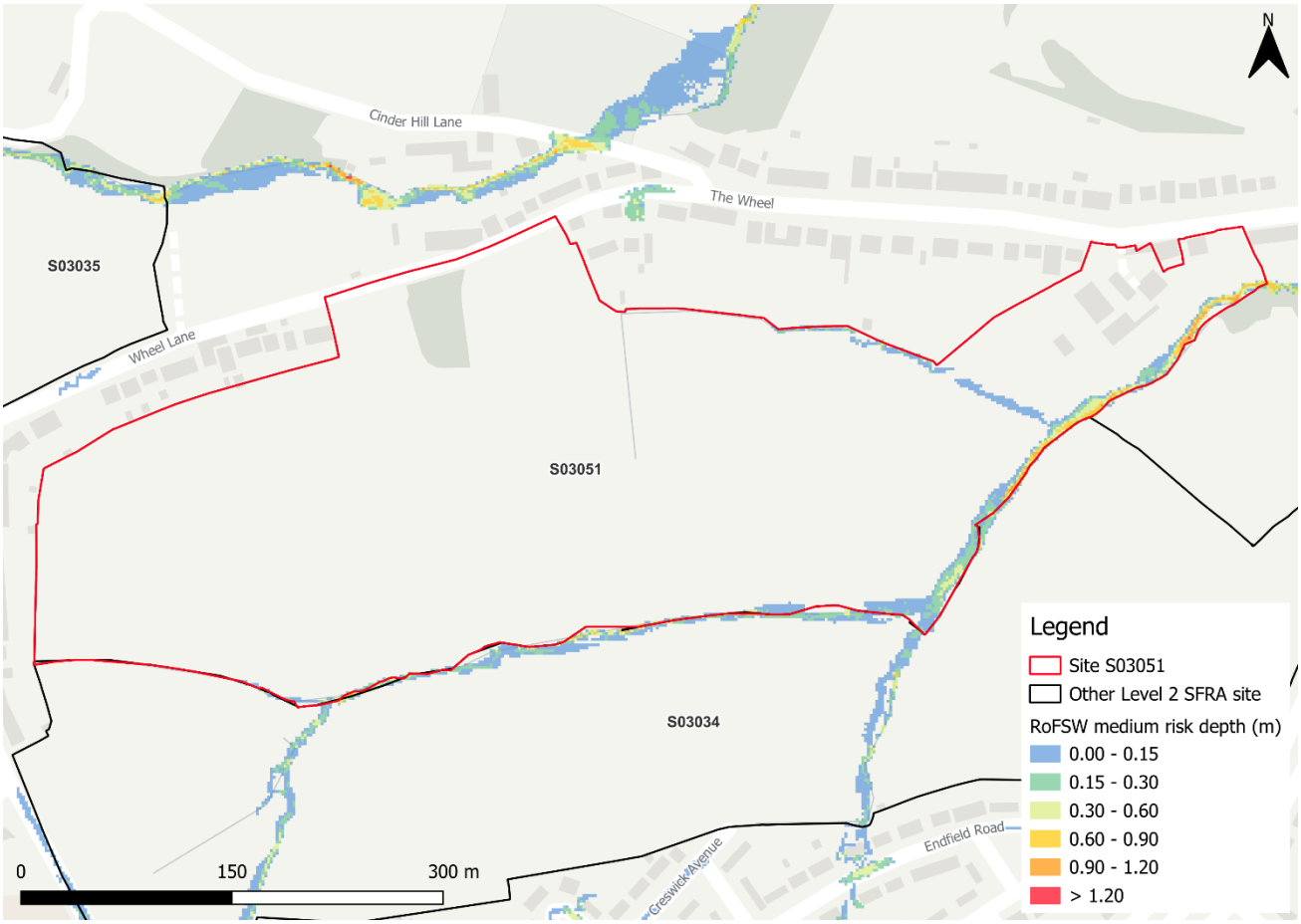


Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

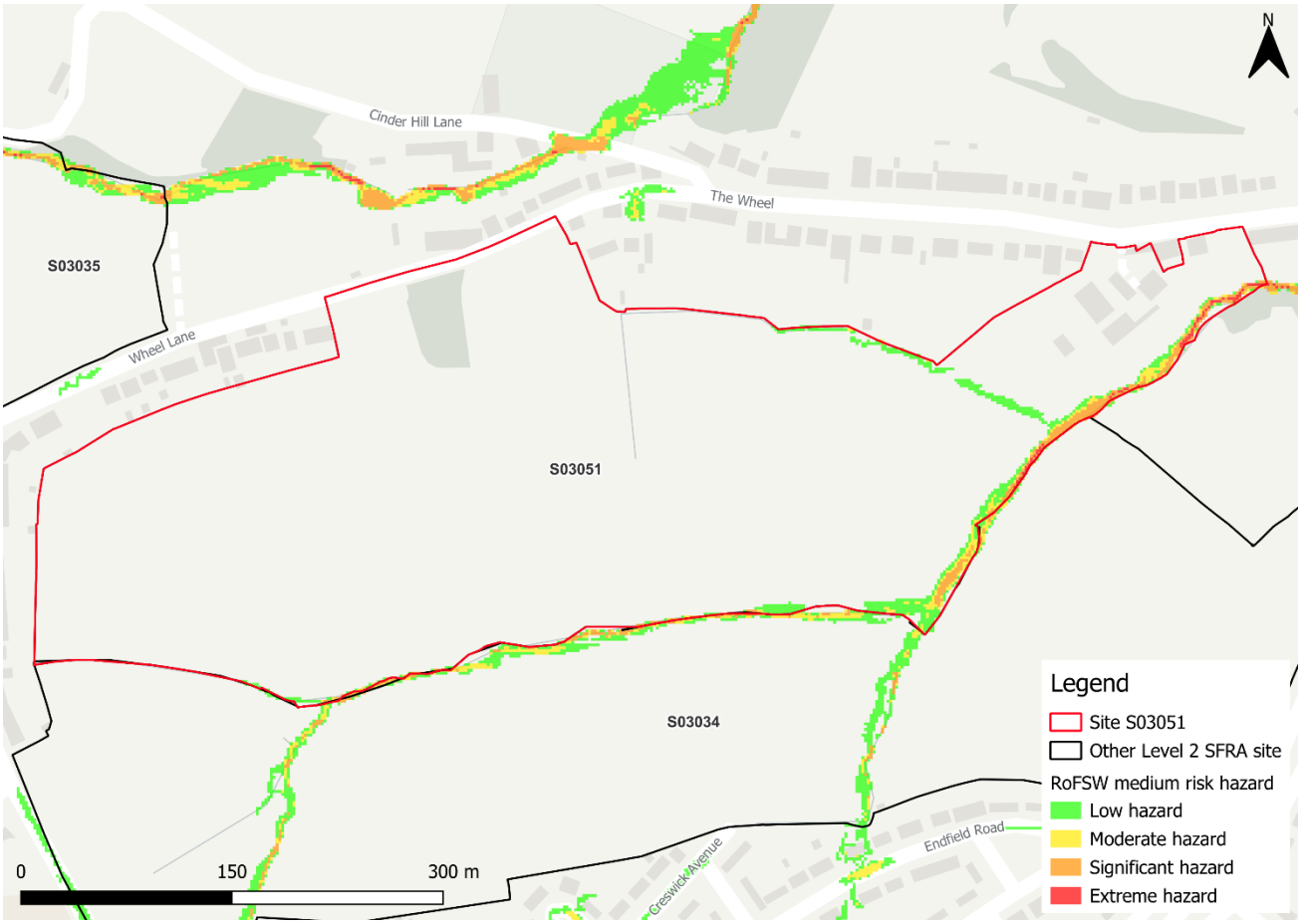


Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

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 for present day conditions, with the medium risk climate change event showing a similar level of risk to the present day low risk event. Maximum flood depths outside of the onsite channel are modelled to increase to between 0.15 and 0.3 m, with hazard categorised as 'low' (Figure 3-4). Safe access and escape routes should remain possible via The Wheel to the north of the site travelling towards the west.

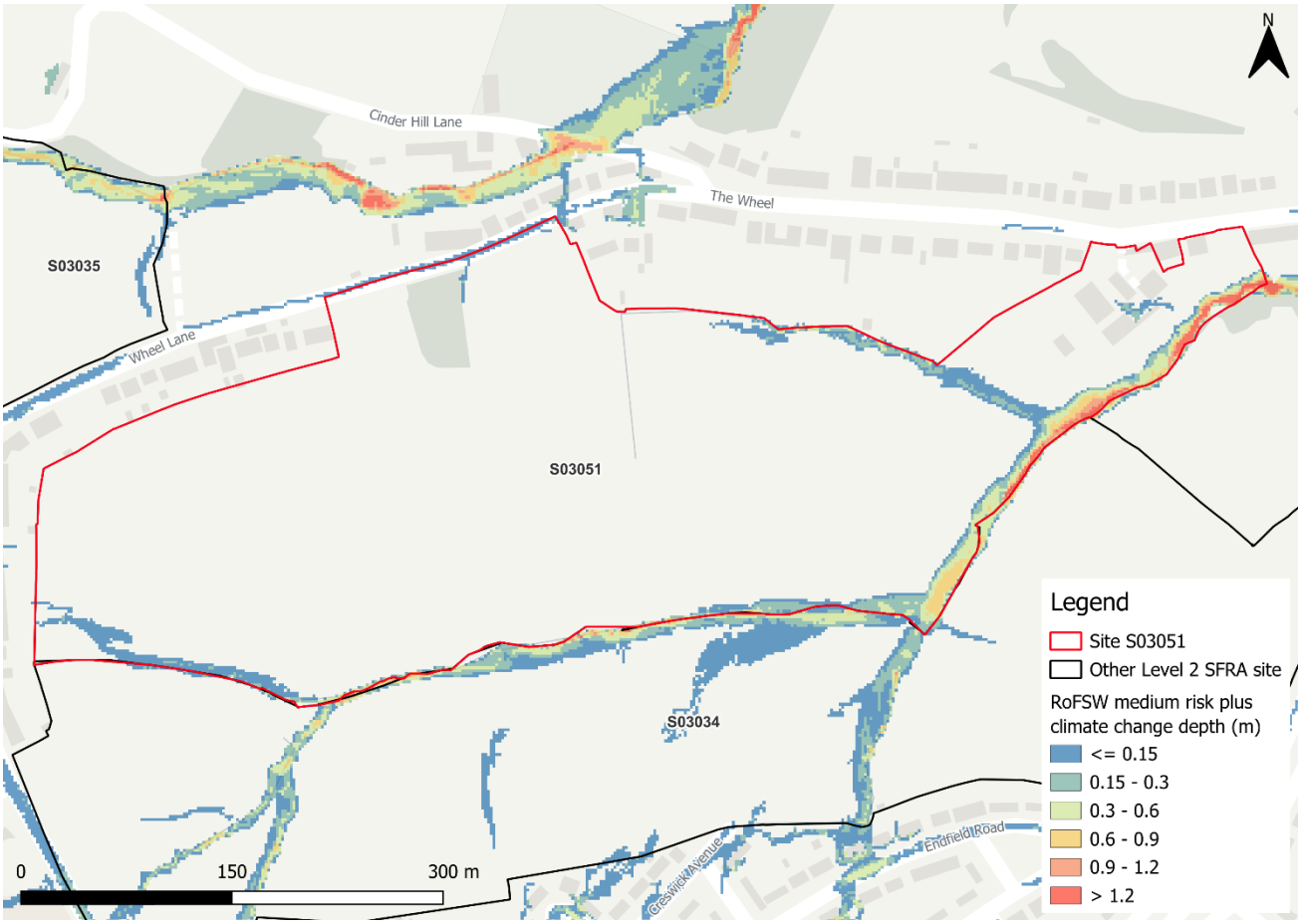


Figure 3-3: Medium risk event surface water flood depths plus 40% climate change (based on Risk of Flooding from Surface Water map)

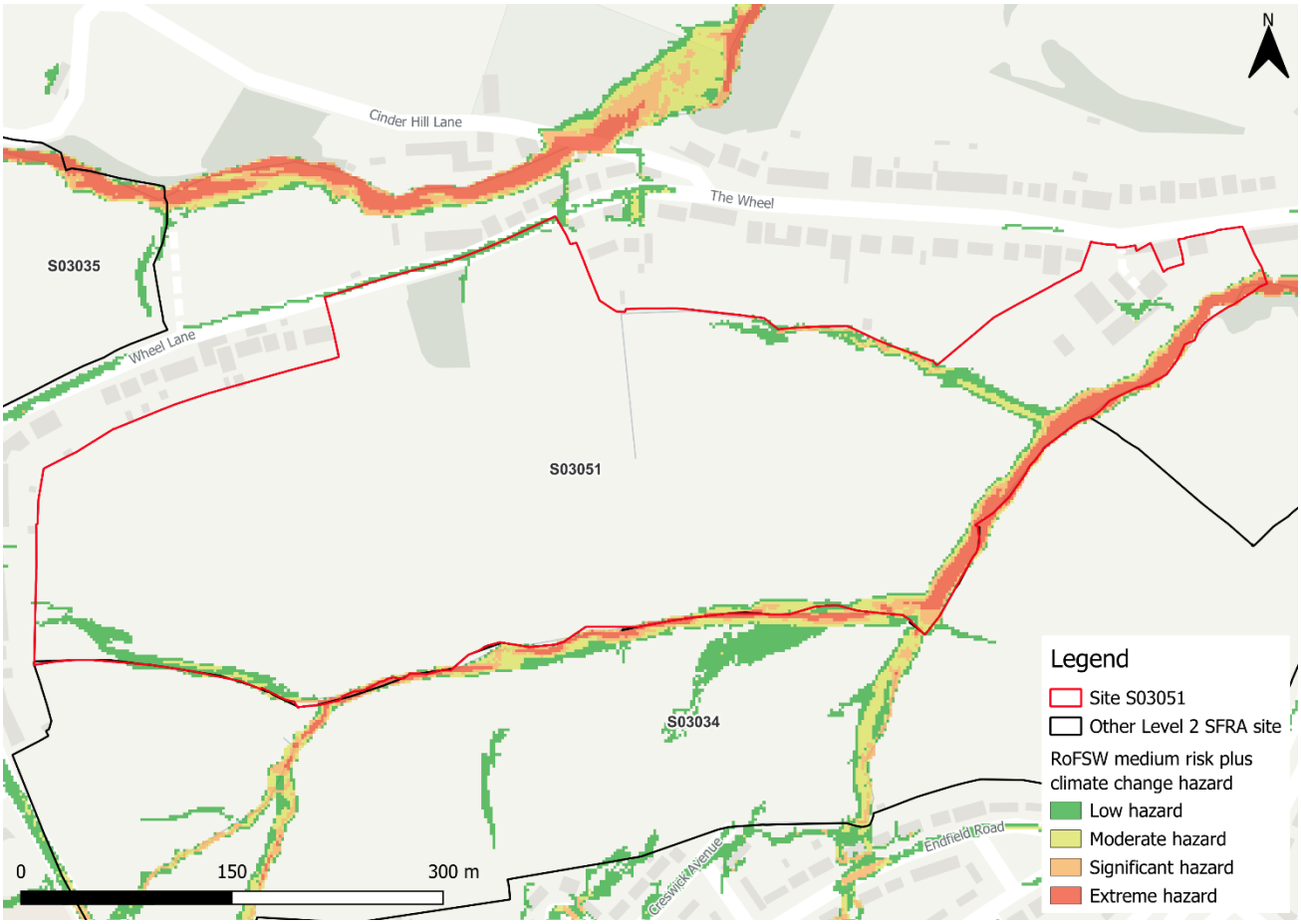


Figure 3-4: Medium risk event surface water flood hazards plus 40% climate change (based on Risk of Flooding from Surface Water map)

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	13058	1076	11982	133.2	0.80 Ha 4.7%
30yr Rainfall+35%	12	14193	1166	13028	144.8	0.87 Ha 5.2%
100yr Rainfall+25%	12*	25720	4843	20877 (8895 exceedance storage)	232.1	1.39 Ha 8.3%
100yr Rainfall+40%	12*	29402	5381	24021 (10994 exceedance storage)	267.1	1.60 Ha 9.5%
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) – 35.59, Q30 – 62.29, Q100 – 74.04.

3.4 Observations, mitigation options and site suitability - surface water

- Current risk is predominantly very low and largely confined to existing channels. Safe access and escape routes would likely be achievable via The Wheel in all events.
- The channels onsite should be kept in place and remain unobstructed. They should be maintained and included within the landscaping design of the residential development as blue green corridors.
- Topographic flow paths and depressions should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include for like for like volumes to ensure risk is contained safely onsite for the lifetime of development.

- For the 1% AEP event plus 40% climate change, approximately 9.5% 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.
- A full 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.
- The NaFRA2 release of the RoFSW should be considered at the FRA stage.
- Note, 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.

Risk of groundwater emergence varies across the site. Within the majority of the site, there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS within these areas. Within the west of the site, there is a risk of groundwater emergence to surface and subsurface assets. Ground survey, including percolation testing, may be required to fully ascertain groundwater conditions within these areas.

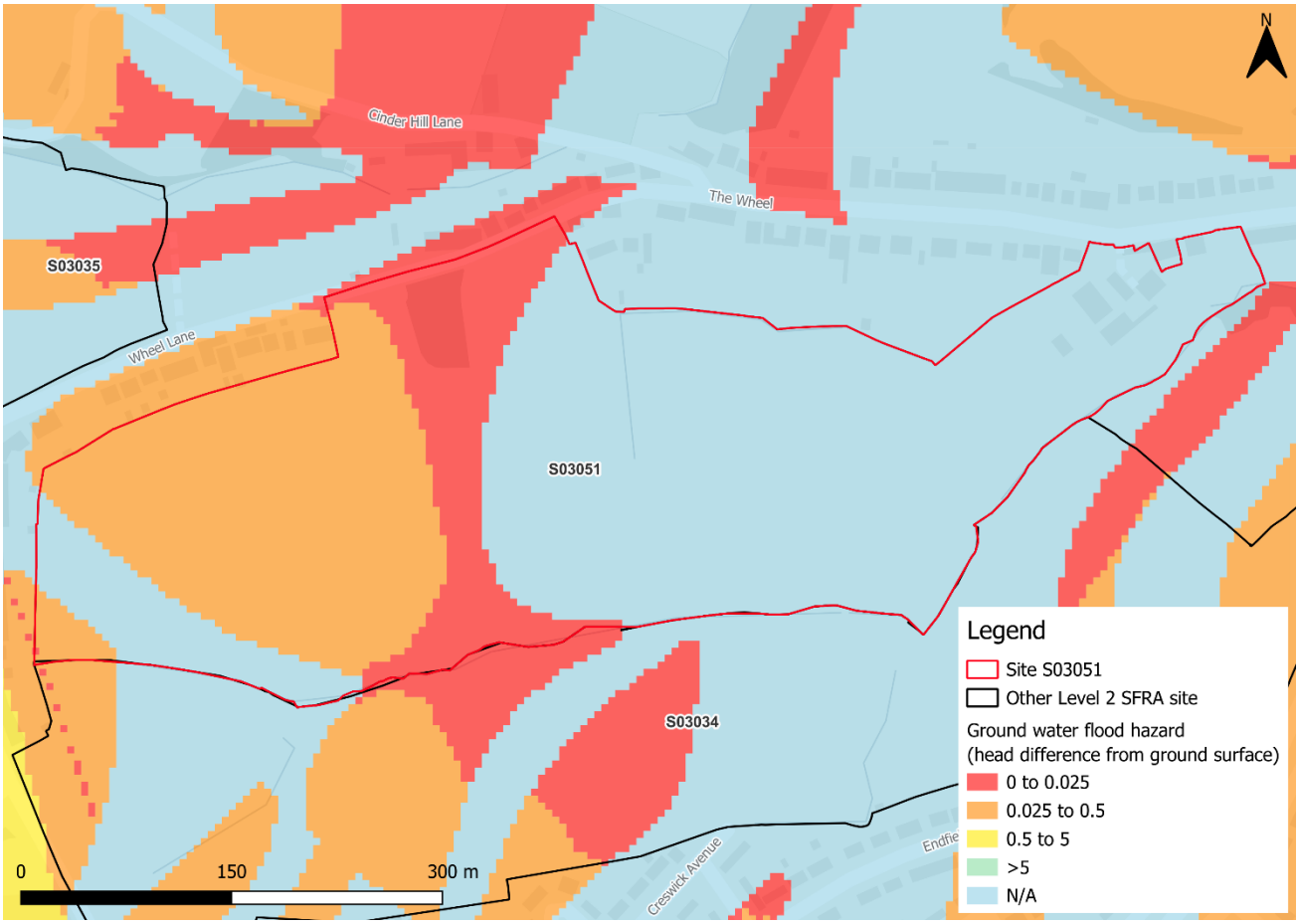


Figure 4-1: JBA 5m Groundwater Emergence Map

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 Onsite culvert blockage

There is potential residual risk to the site from a possible blockage of an unnamed drain which runs along the northern boundary of the site, joining the ordinary watercourse along the southern boundary via a culvert (Figure 5-1). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA, as there is no existing flood model for the watercourse. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site.

Figure 5-1: Potential culvert blockage location

5.2 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 from reservoir flooding.

5.3 Observations, mitigation options and site suitability - residual risk

- There is potential residual risk to the site from a blockage of the culvert which runs beneath the east of the site. Any site-specific FRA should consider the impact of a blockage at this location on flood 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 not located within Flood Zone 3a, however it must still be proven that the development can be safe for its lifetime, which is 100 years for residential development.

Were any future modelling of the unmodelled watercourses to indicate that the site is at risk in the 1% AEP undefended event, the site may then be subject to the exception test, assuming the sequential test has been passed.

6.2 Recommendations, FRA requirements, and further work

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

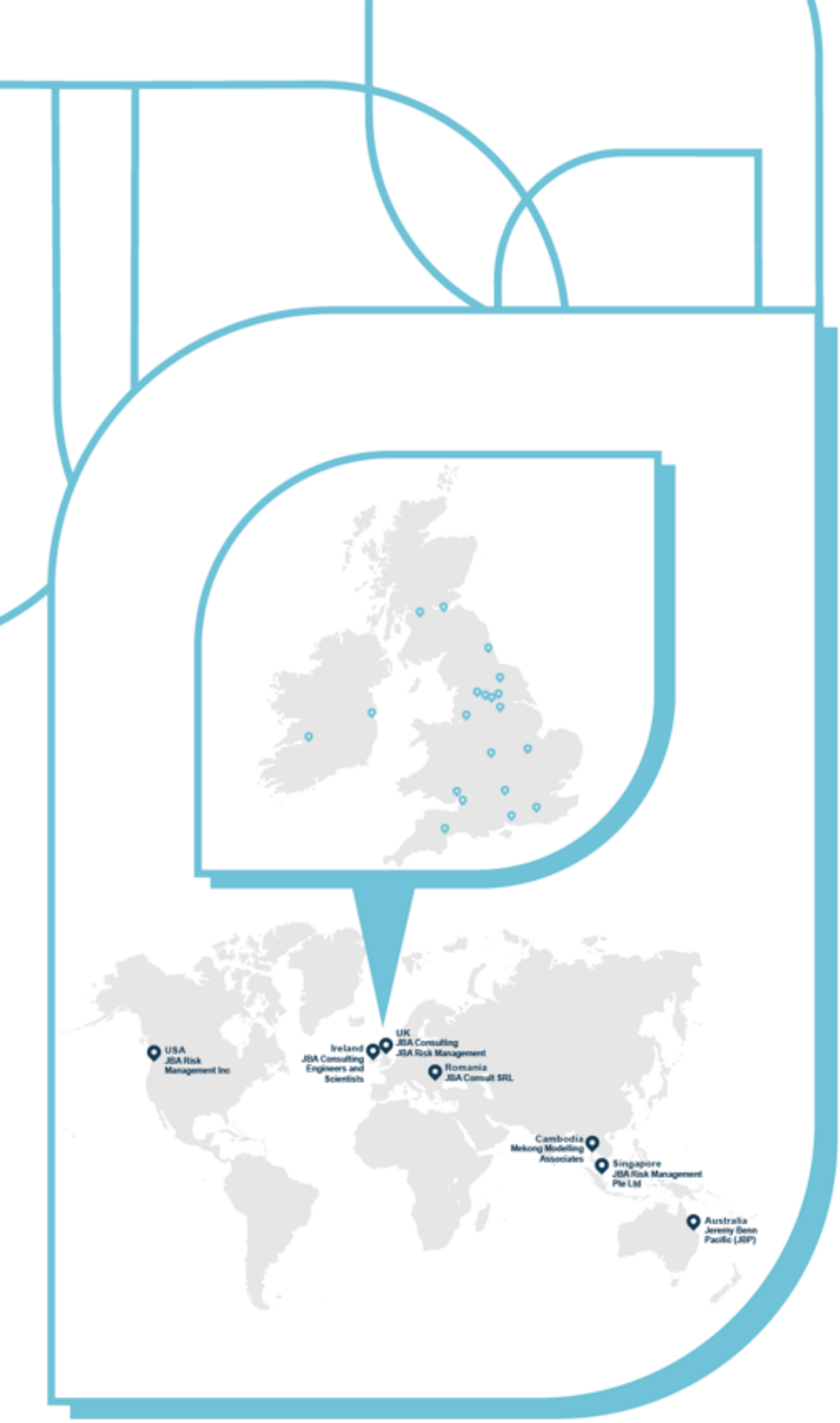
- It should be appropriate to develop this site for more vulnerable purposes given its predominant location within Flood Zone 1. The area of functional floodplain should remain free of development and should be included within a blue green corridor, including for the upstream reaches of the ordinary watercourse along the southern boundary. There should also be an 8 metre no development buffer from the channel banks.
- Any FRA should model the unmodelled watercourse to inform on current and future flood risk. Any modelled risk areas should also be included within a blue green corridor.
- Groundwater conditions across some areas of the site should be investigated further as part of a site-specific FRA. This may need to include for ground survey, including percolation testing to fully ascertain groundwater conditions at the site.
- Any site-specific FRA should undertake a condition assessment of the culvert beneath the east of the site and investigate the impact of a potential blockage of this structure.
- 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

7 Licencing

To cover all figures within this report:

- Contains Environment Agency information © Environment Agency and/or database right [2025]
- Crown copyright and database rights 2025 Ordnance Survey © [2025]
- SCC Ordnance Survey licence number: 100019493 [2025]



Offices at

Bristol
Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Leeds
Limerick
Newcastle upon Tyne
Newport
Peterborough
Portsmouth
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

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
Follow us:

Jeremy Benn
Associates Limited

Registered in England
3246693

JBA Group Ltd is
certified to:
ISO 9001:2015
ISO 14001:2015
ISO 27001:2013
ISO 45001:2018